ORIGINS

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Birds from Dinosaurs

A flight of the imagination

Geophysics of Continents and the Flood

Embryos in a Spin

Let there be Work

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ORIGINS
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No. 28 May 2000

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COVER PICTURE
Red Kites
by Philip Snow

Editorial

WATCHING TV (if you have time!) and listening to the radio can be frustrating experiences on many fronts. In our context of the origins and subsequent history of life, this is especially true.

The BBC seems to have an unwritten determination to propagate the theory of evolution and minimise or dismiss the Bible. Various programmes have been broadcast in the last few months which have caused concern. One promised that it would include a balanced discussion between creationists and evolutionists. Once the broadcast had gone out, it was apparent that the biblical position was not given a fair representation. Several *BCS* members were among those who wrote in. Some went to a lot of trouble to present useful scientific material to substantiate our position. The programme producers argued that the presentation fairly represented our views. The fact that those views had not been presented demonstrated the falsity of the defence.

In 1999, we had the mammoth BBC production on dinosaurs. The technology was stunning (and very expensive), but it was packed with speculation. Time and again we were told that one dinosaur evolved into another, but the mechanism was not given. Of course, 'dinosaur into bird' evolution was presented as fact. Ashby Camp shows us very clearly in this issue of *Origins* that there is no basis to this claim. The article is longer than we normally publish but, because of its importance, we are pleased to present it in this full format.

As this editorial was being drafted, we were being invited to meet our ancestors in *Ape-Man*. Of course, I might be pleasantly surprised at the content, but I doubt it! In contrast, Channel 4, has been more open to broadcasting alternative presentations. A recent offering was on the Stone Age men. Richard Rudgeley began by announcing that they were as gifted as we are. Many of us had been saying that for several decades! Our General Secretary, David Tyler, made valuable contributions on this subject several years ago. Rudgeley has written material (*Lost Civilisations of the Stone Age*; Century, London; 1998) substantiating his claims which were well illustrated in the programmes. It is interesting to note that the popular edition of his work (*Secrets of the Stone Age*; Century, London; 2000) produced to accompany the series was not on display in W H Smith, even though the BBC book is!

Over recent years we have presented the work of our Earth Sciences group in developing a geological model of earth history that was also consistent with Scripture. As with any research project, this is an on-going exercise and the model is gradually being refined to satisfy scientific research. Hopefully it will not be too long before we can bring out a special publication of the integrated work of this group or perhaps we will see a book published! This work is often referred to as the European model by creationists, though not all British creationists accept this approach.

Unfortunately good geological work is often disparaged because it does not fit into a perceived biblical framework. This is why our Society has always encouraged biblical as well as scientific research. The work of our member, Dr. Phil Duce, in reviewing how these two areas of knowledge and revelation can be integrated has been valuable. Another of our members, Dr. Arthur Jones, did some valuable foundational research into the concept of the biblical *kinds* described, for example, in the creation record. We hear that he is updating this work and we look forward to seeing its publication in due season.

We seek to encourage research and provide a vehicle for its publication within the *BCS* framework. One of the questions that often comes up in meetings concerns the mechanism of continental drift. This is a big problem, even within the conventional gradualistic school of geology. One of our members, Professor Sergey Rumyantsev, proposes a model in our *Reader's Viewpoint* pages. It is based on the idea of an *expanding earth* which has been discussed within the wider scientific community. Prof. Rumyantsev seeks to demonstrate how it might be integrated into the biblical position. It is not a full research paper but a means of proposing an idea that might be considered. The model needs to be developed to produce evidence in its support and then show how it can be adapted to explain the sedimentary and palæontological evidence. Whether it succeeds as a working model remains to be seen, but we are pleased to see that our Russian colleagues are active in creation research.

We are encouraged to see the rise of the Intelligent Design movement in America. Though it is having a significant impact over there, it is largely being ignored in Britain. Even christian evolutionists reject it, though we might have expected christians to at least acknowledge that we should detect design in our world. Their reluctance to accept this approach is even more surprising when we note that the movement is not a creationist (or even a christian) one!

This is also an important area of creationist research. Darwin certainly sensed its significance. He is often quoted as saying, 'If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down'. As Michael Behe has shown, the problem is even deeper than Darwin realised since we now recognise the chemical and genetic processes involved. Darwin also realised the problem of the related property of symbiosis. He said, 'If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory, for such could not have been produced through natural selection'. The problem of chance processes over vast periods of time resulting in such systems, simultaneously, is prohibitively large. This is a huge area for detailed creationist research but with powerful potential.

It is the ministry of *Origins* to present the truth and we trust that you will find this to be the case in this issue.

J.H.J.P.

Nice Work

Peter Lewis

I WANT to stress the importance of all work, the importance of your work in God's sight. But let me say at the start that you will always be more important than your work and that your character matters to God more than your achievements. In a society which has little to say about the first and endlessly exalts the second, this is a vital Christian perspective.

Put another way, some of the greatest achievements are unsung by the world because they have been made in the realm of the spirit. However, Christian people should have a theology of work.

'Work'

The Bible is full of it. We first meet God at work as Creator: the great Physicist, Engineer, Botanist, Zoologist and Biologist. He is still the Sustainer of all and our Guide, Teacher, Healer and Partner. 'My Father is working still and I am working,' said Jesus to His critics. In Genesis 1:26 and 2:15 those made in His image are made to work, and throughout the Bible we have an album of photographs of working people: farmers, weavers, leather-workers, merchants, judges, soldiers, businessmen and women, homemakers, midwives, teachers, masters and servants. And we know who became a carpenter in Nazareth.

Jesus and work

If Jesus had been brought up in a monastery we might have thought that religion had no relevance to everyday life in the real world. But Christianity is founded on the knowledge that God has entered our race: and when He came of age in his humanity He entered a trade, and developed a skill. This is not so surprising when you consider that it was by the Son of God that the worlds were made. As we open our Bibles we first meet God in His working clothes.

In Genesis we read: 'The Lord God took the man and put him in the Garden of Eden to work it and take care of it'. Adam was not to be idle in Eden and we (whether employed or not) are not to be idle either. We find much of our duty in the work we do and much of our dignity too. It is part of our humanness, even part of our identity. We get a sense of satisfaction from it and make a serious contribution to society in it. Most of all we can please and glorify God by the work we do, whether it is impressive or menial, seen or unseen, large or small.

Work—we need it!

I was fascinated to learn a while back from the national lottery company that more than half of its new millionaires are still working! All of which confirms that we were made to work, that it is part of the image of God in us.

I was thinking the other day that every job of work you have done or are doing, God has done before you in principle. Furthermore, whatever you are doing at work God is doing it with you, interested, concerned, helping (but not doing it for you!) and ready to say at the end of the day, 'We've had a good day today, son, daughter, haven't we?' It's a sad mistake to think you only please God when you look up from the job and pray. God is pleased and glorified when you do the job well with full concentration and involvement as one of His children. When the surgeon is operating on me I do not want him to be thinking of Daily Light or praying about his unconverted neighbour: I want him to be thinking about me—and so does God!

However, please do not think that I am going to romanticise work in this article. The Bible is a very realistic book. Though it begins in the Garden of Eden it does not stay there long. In Genesis chapter 3 we read of mankind's first disobedience, the rebellion and treachery of the man and his wife who try to be 'like God' by eating the forbidden fruit.

Work and the Fall

Whereas work before the Fall was a blessing, after the Fall it had to cope with the curse inflicted on the world because of sin (Genesis 3:17–19). However, as Leland Ayken points out in *Work and Leisure in a Christian Perspective* (IVP, 1989, p.129), 'The Fall changed work but did not cancel work as a duty'. The new element is that it must now be accomplished 'against the hostility of the environment in which work occurs ... striving against forces that resist the workers' efforts and encountering that frustration and meaninglessness that Ecclesiastes talks about. Sinful men and women themselves provide much of this in exploitation, corruption, bad workmanship and idleness.'

The result of all this is that the work-place is not only a place of satisfaction, but also a place of conflict, uncertainty and stress. 'Beneath the apparently tedious, bland surface of office life, with its euphemisms and its formal ways and its elaborate circumlocutions, every known emotion and motivation seethes and bubbles—ambition, greed, ruthlessness, duplicity, cowardice, treachery, lust, kindliness, tolerance, forgiveness, affection and even love.' (from *The Chatto Book of Office Life*, edited by Jeremy Lewis).

Society's work crisis today

Some years ago a researcher in the US, Stud Terkel, produced a 589-page book which has become something of a classic on contemporary attitudes toward work. It goes a long way to showing that our society is suffering from a work crisis. We still live in the world of the Fall for all our technological and other advancements. His opening paragraph reads: 'This book, being about work, is, by its very nature, about violence—to the spirit as well as to the body. It is about ulcers as well as accidents … about nervous breakdowns as well as kicking the dog around. It is, above all (or beneath all), about daily humiliations. To survive the day is triumph enough for the walking wounded among the great many of us' (*Working: people talk about what they do all day and how they feel about what they do,* by Stud Terkel, quoted in Leland Ayken's *Work and Leisure in a Christian Perspective,* p.44.)

Yet it is precisely in that sort of world God has put us; it is in that sort of world the Bible speaks and it is for life and work in that sort of world that the Bible and the Holy Spirit equips us. Listen to the apostle Paul in Ephesians 6:5–9. It wasn't easy then and it isn't easy now. But it is possible: triumphantly, gloriously possible. The Christian man or woman can be a worker of integrity; a peace-maker known to resolve conflict, a help by word and deed.

Witness at work

Lewis Trippett was a lawyer working for a telephone company in the States. One day a woman came in from the accounts department. He had never seen her before. She asked him if he was Lewis Trippett. With some trepidation he replied: "Yes, I am." Then she said: "You're the only one in this department with any integrity—don't change. Everyone else abuses their expenses." Then, as abruptly as she came, she left. Little things make a difference. (From Mark Green's, *Thank God it's Monday*). 'Let your light shine before men that they may see your good deeds and praise your Father in heaven.' This is a main part of what the New Testament calls 'worship'. You may be surprised to learn that in the New Testament the term 'worship' is connected with daily life more than with 'going to church'.

Work and worship

In the New Testament 'worship' is the consecration of our bodily lives and daily walk and work (Romans 12:1). We do not just go to church to worship but we go to work to worship too. In the one we worship by adoration, and in the other we worship by imitation—working as God works: creatively, purposefully, reliably and righteously. Working to help others as well as ourselves, contributing to the common good of society, its strong and its weak, those who can help us in return and those who cannot. And we do so to God's glory and in grateful love for our creation, preservation and salvation. As the Puritan John Cotton says: 'All the life I live, is by faith in the Son of God' (quoted in Ayken, p. 135).

It's significant that I should quote someone who was in the Puritan tradition, because a new light was shone on the whole subject of work by the 16th-century Reformers and the 17th-century Puritans. Let me explain.

The Greeks had no concept of the dignity of labour (Plato's *Republic* was built on a slave class). The Romans saw unskilled labour as unworthy and sordid. The Church of the Middle Ages and earlier saw secular work as second-best. The 16th-century Renaissance recognised the dignity of crafts and the arts.

But the Protestant Reformers, Luther, Calvin, and the 17th-century Puritans recognised the dignity of all labour and raised it to the level of 'vocation', *i.e.* a calling from God.

Three callings

The Reformation Puritans commonly spoke of three callings. First of all God calls us to a godly life: He calls us to come to Christ His Son in repentance and faith and to take Him as our Lord and Saviour. This is the supreme calling which takes precedence over all else in life.

Secondly, God calls us to specific spiritual ministries and tasks among the communities of His people in the church. His Holy Spirit equips us with gifts for just that: that we might encourage and 'build up' one another.

However, they also went on to say that there was a third calling from God—the call to our different ordinary everyday occupations. They raised the common man and woman's daily job to the level of a divine vocation. Farmhand or milkmaid, miller or merchant, housewife or pastor, all had their calling to that work from God who valued them and their work and could be served and glorified in precisely that work done well and to His glory.

The apostle Paul tells the young church at Corinth where some people had become 'super-spiritual' and even seem to be hanging loose to important earthly ties and duties in marriage and work: 'Each one should retain the place in life that the Lord assigned to him and to which God has called him' (1 Corinthians 7:17).

Let me say at once that all this was said, not to 'keep the workers down', but to affirm them in their work and place in life and society, not to keep people down but to raise them up. We are called to be equally valued here. And God values everyone's work.

We need everyone's work if we are to live in a decent and prosperous society. Our work connects us all in any society; our own work is our gift and God's gift to that society. The doctor and the dustman need each other, for if the dustman cannot safely do without the doctor, neither can the doctor do without the dustman. If he thinks he can, let him see how long he survives knee-deep in garbage. 'Whatever you do, work at it with all your heart … It is the Lord Christ you are serving' (from Colossians 3:23–24).

His work in his world

Always remember God is interested in your work and in your task, however humble or mundane it may seem, because it is his work too. His work in his world, a work sustained in every part by His goodness and mercy. From crops to computers, His wisdom and kindness keeps our world going and our human race moving forward.

THE AUTHOR

Peter Lewis is pastor of the Cornerstone Evangelical Church, Nottingham. This is his first contribution to *Origins* and we welcome him to our pages.

On the Alleged Dinosaurian Ancestry of Birds

Ashby L. Camp

THE RECENT discoveries of *Protarchæopteryx robusta* and *Caudipteryx zoui* are being hailed as conclusive proof that birds evolved from theropod dinosaurs (Ji *et al.*, 1998; Ackerman, 1998).[1] According to Kevin Padian, an expert in the field and a long-time proponent of the dinosaur theory, these finds 'should lay to rest any remaining doubts that birds evolved from small coelurosaurian dinosaurs' (Padian, 1998, p.730).[2]

This confidence has understandably taken root in the popular press, where one writer described the dinosaur-bird link as 'now pretty close to rock solid' (Lemonick, 1998, p.83). The purpose of this article is to explain why the case for dinosaurian ancestry of birds is far from closed.

Some background

The idea that birds descended from dinosaurs was first suggested by Thomas Huxley in 1868 on the basis of skeletal similarities between *Archæopteryx lithographica* and *Compsognathus longipes*, a chicken-size coelurosaur recovered from the same formation as *Archæopteryx* (Feduccia, 1996, pp.28, 52).[3] Of course, *Compsognathus* itself could not qualify as an ancestor for *Archæopteryx* because it was 'too late in time (as a direct contemporary of *Archæopteryx*) and too specialized in the reduction of the manus to two digits' (Carroll, 1988, p.340).[4] Nevertheless, *Compsognathus* was considered illustrative of the kind of creature from which *Archæopteryx* evolved. It was believed that the features shared by the two species had been inherited from a common dinosaur ancestor that was more like *Compsognathus* than *Archæopteryx*.

A number of experts (*e.g.*, Seely and Vogt) resisted Huxley's theory, arguing that the similarities between *Compsognathus* and *Archæopteryx* were probably the result of convergent evolution rather than common descent from an earlier dinosaur (Feduccia, 1996, pp.55,67).[5] As a result, Huxley's views never gained general acceptance (Padian and Chiappe, 1997, p.73). In 1913 Robert Broom described *Euparkeria*, a small, 230-million-year old thecodont, and argued that it was the common ancestor of both theropod dinosaurs and birds. This made theropods an evolutionary side branch having nothing to do with the origin of birds. Following the publication in 1926 of Gerhard Heilmann's classic, *The Origin of Birds*, the thecodont (as opposed to theropod) ancestry of birds became a matter of textbook orthodoxy for the next fifty years (Feduccia, 1996, p.55).

The theropod theory of bird origins was revived in the mid–1970s through a series of papers by John Ostrom. He detailed a number of similarities between *Archæopteryx*

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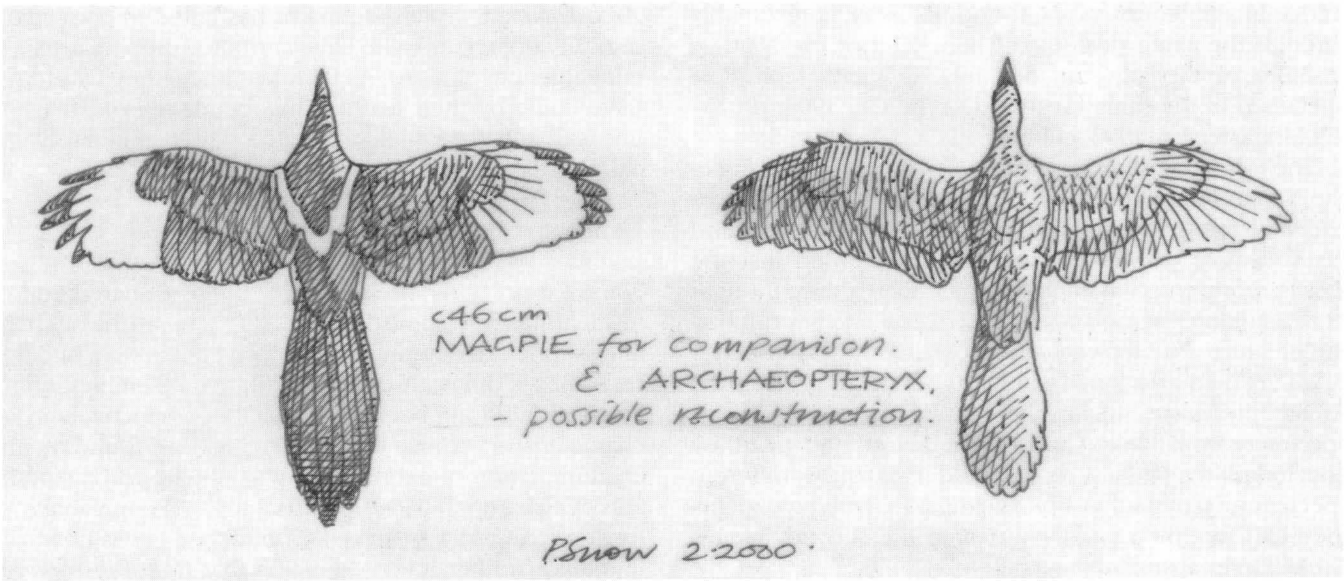
[1] 'Theropod dinosaurs' refers to a wide variety of bipedal, carnivorous dinosaurs. Many of the features that distinguish them from other dinosaurs occur in the legs, feet, and hands. (Fastovsky and Weishampel, 1996, pp.261, 271–272). In the Linnæan system of classification, theropods are those creatures in the Class Reptilia, Subclass Diapsida, Infraclass Archosauromorpha, Superorder Archosauria, Order Saurischia, Suborder Theropoda. (Carroll, 1988, pp.615–621). In cladistic classification, 'theropod dinosaurs' are those creatures in the clades Reptilia, Diapsida, Archosauromorpha, Archosauria, Ornithodira, Dinosauria, Saurischia, and Theropoda. (Fastovsky and Weishampel, 1996, pp.86–89, 271–273). For a brief note on the classification differences, see Glut, 1997, p.18. Conventional dating is assumed *arguendo* throughout the paper.

[2] Coelurosauria is a subset of Theropoda. In the Linnæan system of classification, theropods were traditionally divided into the Infraorders Carnosauria and Coelurosauria. These taxa have been abandoned in that system because the features once thought to distinguish the two groups were found to be combined in a number of genera. (Carroll, 1988, pp.290, 621). Coelurosauria as a clade designation includes compsognathids and the clade Maniraptora. Cœlurosaurs are distinguished from other theropods by their expanded circular orbit, semilunate carpal in the wrist, short ischium, heightened ascending process of the astragalus, and reduction of the transverse processes of the tail vertebræ. (Fastovsky and Weishampel, 1996, pp.274–275; see also Padian, 1997, p.550).

[3] *Compsognathus* was considerably larger than *Archæopteryx*, its estimated weight being six to seven pounds compared to about one pound for *Archæopteryx*. (Carroll, 1988, p.291; Carroll, 1997, p.314). The estimated weight for the smallest *Archæopteryx* specimen is a mere 7–9 ounces. (Swartz, 1998, p.356). 'By comparison with the Solnhofen *Archæopteryx*, which is the largest example, the others in size, are as follows: Solnhofen 100 percent, London 90 percent, Maxberg 87 percent, Berlin 77 percent, *Archæopteryx bavarica* 66 percent, and Eichstatt 50 percent.' (Feduccia, 1996, p.35). The latest *Archæopteryx* specimen was described by Wellnhofer in 1993. He considered it sufficiently different from the others in the relative length of its tibiæ and hind legs to be named a new species, *Archæopteryx bavarica*. (Feduccia, 1996, p.32).

[4] Though *Compsognathus* is accepted as a contemporary of *Archæopteryx*, the precise location at which the holotype was found is unknown. It was collected in the late 1850s, apparently by physician and amateur fossil collector Dr. Oberndorfer. John Ostrom and Peter Wellnhofer attempted to determine the precise source of the fossil 'but were only able to conclude that it came from lithographic facies of the Solnhofen Limestone, probably from the Riedenburg-Kelheim area.' (Glut, 1997, p.307).

[5] Those convinced that the similarities between dinosaurs and birds were the result of convergence include Mudge (1879), Dollo (1882, 1883), Dames (1884), Parker (1887), Furbringer (1888), Osborn



and theropods, focusing especially on *Deinonychus antirrhopus*, a lightly built, 110-million-year old dromæosaurid that he discovered in 1964 (Padian and Chiappe, 1997, p.73; Feduccia, 1996, p.66).[6] Subsequent cladistic analysis supported and refined Ostrom's claim by identifying dromæosaurids as the group that shared the greatest number of derived characters with *Archæopteryx*.[7]

By the mid–1990s, Ostrom's theory had become 'practically dogma among vertebrate palæontologists' (Feduccia, 1996, p.66). Thus, even before the recent finds, one was assured: 'Birds are dinosaurs. And not all dinosaurs have gone extinct; one group, the birds, survives. What did dinosaur meat taste like? A trip to Kentucky Fried Dinosaur, or a mouthful of Dinosaur McNuggets can answer that question!' (Fastovsky and Weishampel, 1996, p.321). With the report of *Protarchæopteryx* and *Caudipteryx*, the 'theropodists' have openly declared victory.

Recent finds: Round 1

The discoveries of *Protarchæopteryx* and *Caudipteryx* were preceded by the discovery of *Sinosauropteryx prima*, a small theropod, similar to *Compsognathus*, that had short, fibrous structures along its spine and on other parts of its body (Chen *et al.*, 1998, p.150). There were early rumours that the structures were downy feathers, but that turned out not to be the case.[8] However, the belief that these filaments were holdover 'protofeathers' is still very much alive (in addition to Monastersky, 1997 and Gibbons, 1997c, see Chen *et al.*, 1998, p.152, Padian and Chiappe, 1998a, p.45, Ackerman, 1998, p.78 and Norell, 1998, p.33).

The holotype for *Sinosauropteryx* was found by farmer Li Yin Fang in June 1996 in the Yixian Formation in Liaoning Province (a far northeastern province of China).[9] Mr. Li sold the fossil to a dealer who sent it to Ji Qiang, the director of the National Geological Museum in Beijing. The

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(1900), Broom (1913), Heilmann (1926), Simpson (1946), de Beer (1954), and Romer (1966). (Feduccia, 1996, p.67).

[6] Dromæosauridæ is a Family in the Suborder Theropoda. (Carroll, 1988, p.621). Prior to the recent discovery of *Sinornithosaurus millenii*, Dromæosauridæ was divided into two Subfamilies: Velociraptorinæ and Dromæosaurinæ. Velociraptorinæ includes the genera *Deinonychus*, *Saurornitholestes*, and *Velociraptor*. *Dromæosaurus* is the only 'unquestionable' genus in Dromæosaurinæ, but *Adasaurus* has been referred to it. (Currie, 1997b, 194). *Sinornithosaurus millenii* was placed within Dromæosauridæ but not within either of the existing Subfamilies. (Xing *et al.*, 1999b). With the possible exception of *Sinornithosaurus millenii*, the live weight of dromæosaurids ranged from 66 to 176 pounds, and most of them were six to ten feet in length. They are distinctive in the possession of a highly mobile hand-wrist complex, unique caudal vertebral adaptations, and a large, sickle-like claw on their feet. (Ostrom, 1990, pp.269–271; Currie, 1997b, pp.194–195). The holotype of *Sinornithosaurus millenii* is eagle size (Sloan, 1999, p.102), but one wonders whether that specimen had reached full adulthood.

[7] The most influential of these analyses was Gauthier (1986). See also Holtz, 1994. Cladistic analysis (also called phylogenetic systematics and Hennigian systematics), which has gained prominence in the last twenty years, is the classification of creatures into subsets on the basis of characters (recognizable attributes) they uniquely share. Such characters are regarded as having been inherited from a common ancestor who possessed them. It differs from the methodology of 'evolutionary systematics' in its exclusive focus on shared, derived characters. Evolutionary systematics employs 'an eclectic spectrum of evidence from all lines of biological information to establish relations. Such lines of evidence might derive from a blend of such disciplines as comparative anatomy and embryology, functional anatomy and biomechanics, biochemistry, physiology, and behaviour.' (Feduccia, 1996, p.56).

[8] In October 1996, Philip Currie said of the filaments, 'They look so much like the feather impressions seen in the bird fossils at the same site that you can't come to any conclusion other than the fact that you're dealing with feathers.' He then equivocated with, 'Now, they may not be feathers. They may be featherlike scales, they may be hair, they may be something else. Until the detailed work is done on it, you can't really tell. But the bottom line is that, now, I don't think there is any question that these dinosaurs had insulation of some kind, and in all probability it was feathers.' (Monastersky, 1996. See also, Gibbons, 1996a and Gibbons, 1997a). It was reported in May 1997, however, that 'an international team of researchers that examined the Chinese fossil now concludes that the fibrous structures are not feathers.' (Monastersky, 1997. See also Gibbons, 1997c).

[9] The consensus is that these fossil beds are younger than the Solnhofen Limestones in which *Archæopteryx* was found, but there

mirror-image counterslab found its way, presumably through the same dealer, to Chen Pei-ji of the Nanjing Institute of Geology, as did another nearly complete specimen of the same creature (Ackerman, 1998, pp.76–77; Monastersky, 1996; Gibbons, 1996a, p.720).

The following summer, farmers working for Ji Qiang in the Yixian Formation found three turkey-size fossils that had well-preserved evidence of true feathers. Ji Qiang and his colleague, Ji Shu-An, originally concluded that the fossils represented a single species, which they thought bore a striking resemblance to *Archæopteryx.* They dubbed the creature *Protarchæopteryx robusta* and published a brief report describing it as a new genus of Archæopterygidæ. It was not until they examined the specimens with Philip Currie in the fall of 1997 that they concluded the fossils represented two quite different species and that neither was as similar to *Archæopteryx* as they had first thought. They named the second species *Caudipteryx zoui.*[10]

The plumage on *Protarchæopteryx* and *Caudipteryx* is said to be identical to feathers on modern birds, but neither is believed to have been capable of flight because they had relatively short forelimbs (wings) and symmetrically-shaped feathers like those seen in flightless birds today.[11] Proponents of the theropod theory consider them to be dinosaurs rather than birds 'because they lack a number of features seen in *Archæopteryx* and more advanced birds' (Monastersky, 1998, reporting the comment of Mark Norell).

The significance of these fossils depends largely on whether they are feathered dinosaurs or flightless birds. To call them feathered dinosaurs is to claim that they did not descend from birds. If that is correct, it means, from an evolutionist perspective, either that they shared a feathered ancestor with birds or that feathers evolved more than once. The latter option is considered unlikely because feathers are such complex structures.[12] So if these creatures are feathered dinosaurs, the favoured conclusion of evolutionists is that they descended from the same feathered ancestor as birds, an ancestor that also would be classified as a dinosaur.

If, on the other hand, *Protarchæopteryx* and *Caudipteryx* are flightless birds, they would provide little, if any, new ammunition for the theropod theory. The fact they resemble cœlurosaurs in a number of features would be consistent with theropod ancestry, but they offer at best a marginal advance of the similarity argument provided by *Archæopteryx,* which argument has failed to convince a minority of experts (who have attributed the similarities to convergent evolution). As flightless birds, they would not have come by their feathers independently of the avian lineage, and thus their existence would not imply the existence of a feathered, pre-bird ancestor.

Dinosaurs or birds?

Some extinct birds, such as *Archæopteryx,* shared quite a few features with some theropods. That raises the question of how one can determine whether a creature is a bird that resembles a dinosaur or a dinosaur that resembles a bird. Feathers had long been accepted as a distinctively avian characteristic because they had never been found on any creature, living or extinct, that was not a bird (Fastovsky and Weishampel, 1996, pp.294, 304). The presence of feathers marked a creature as a bird, but one is now told that this is an invalid criterion and that *Protarchæopteryx* and *Caudipteryx* were dinosaurs despite the fact they possessed feathers (Padian, 1998, p.729).

Before it can be concluded that feathers do not prove avian rank, they must be found on a creature that clearly is not a bird. The evidence for the creature's non-avian status must be compelling enough to overcome the presumption of avian status created by the presence of feathers. Only then can one be confident that the diagnostic role assigned to feathers was erroneous. If, for example, someone claimed to have found hair on a reptile, it would need to be established that the creature was indeed a reptile, rather than a previously unknown mammal, before hair was jettisoned as a uniquely mammalian trait. (Carroll states, 'Hair is a uniquely mammalian tissue that is not directly homologous with any derivative of the skin present in other amniotes'; Carroll, 1998, p.411).

The claim that *Protarchæopteryx* and *Caudipteryx* were dinosaurs rather than birds is made with a certainty far exceeding the evidence. Larry Martin and Alan Feduccia, two experts on bird evolution, and John Ruben, a zoophysiologist, are all convinced these creatures were flightless descendants of earlier flying birds and were more 'advanced' than *Archæopteryx* (Gibbons, 1998; Monastersky, 1998).[13] The dating is certainly consistent with that view, as the new fossils are believed to be some 25 million years younger than *Archæopteryx* (see note 9).

Ji *et al.* excluded *Caudipteryx* from Avialæ because it reportedly lacked the following features shared by members

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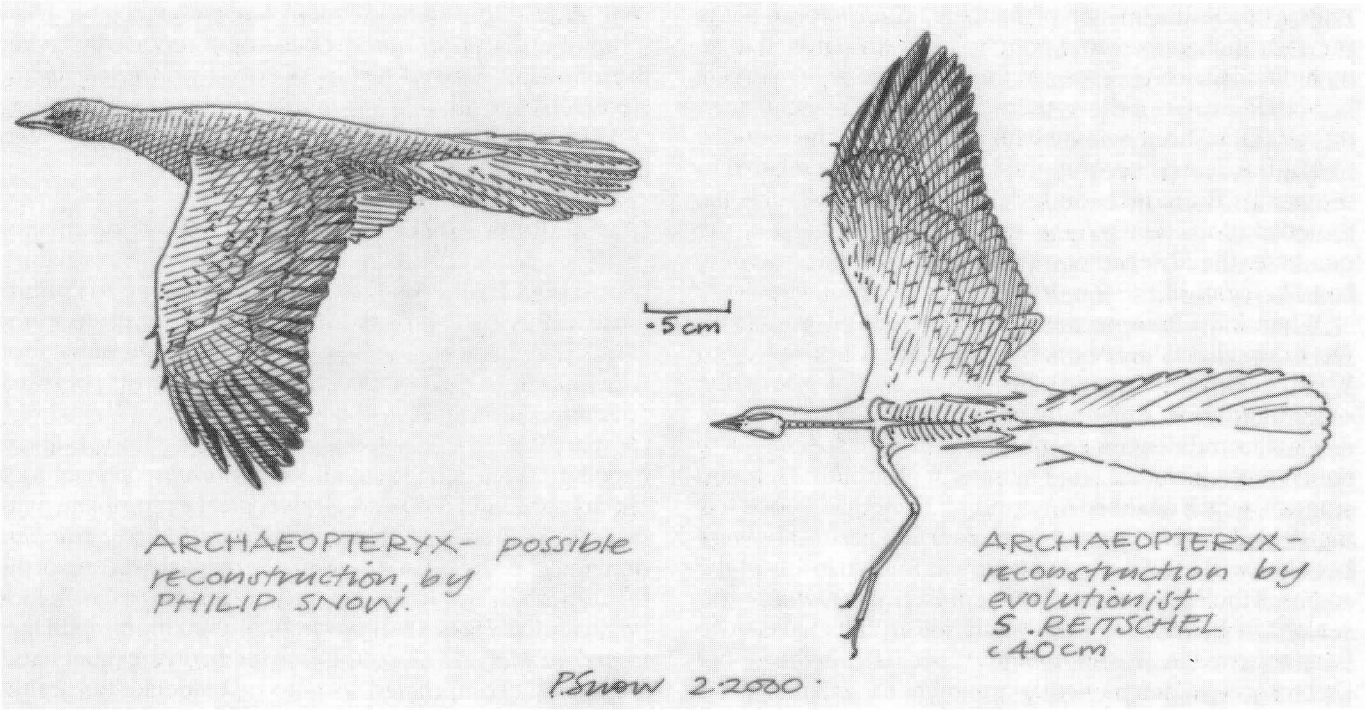
has been disagreement over how much younger. An argon-argon analysis yielded a date of about 121 mya, but radiometric dates of 137—142 mya have also been reported. (Gibbons, 1996b, p.1083; Anonymous, 1997, p.21). As of June 1998, ranges of 135—120 mya and 145—125 mya were being quoted (*e.g.*, Gibbons, 1998, p.2051; Monastersky, 1998, p.404). Norell used an estimated date of 135—122 mya. (Norell, 1998, p.33). Ackerman said the beds have 'not yet [been] conclusively dated but [are] probably more than 120 million years old—the Early Cretaceous period.' (Ackerman, 1998, p.86). Others were content to speak simply of an 'Early Cretaceous age.' *e.g.* Chen *et al.* (1998, p.147). The most recent, and purportedly definitive, dating effort yielded a middle Early Cretaceous date of 124 mya. (Swisher *et al.*, 1999).

[10] The circumstances of the discoveries can be gleaned from Gibbons, 1998; Ackerman, 1998, pp.86–89, 95; and Unwin, 1998, p.120. The original article on these finds was Ji and Ji, 1997. (This journal is in Chinese, but the translation of the title is provided in Chen *et al.*, 1998, p.152.)

[11] Mark Norell says of the feathers, 'They are just like feathers on modern birds.' (Gibbons, 1998). According to Philip Currie, 'The plumage on the new Chinese dinosaurs . . . is identical to bird feathers.' (Monastersky, 1998). Kevin Padian agrees that the feathers on *Archæopteryx* 'are not much different qualitatively' than the feathers on these specimens.


ARCHAEOPTERYX- possible reconstruction, by PHILIP SNOW.
·5 cm
ARCHAEOPTERYX- reconstruction by evolutionist S. REITSCHEL c 40 cm
P.Snow 2·2000·

of that clade (which features are defined as 'derived' based on comparisons of Velociraptorinæ, *Archæopteryx*, and some more modern birds):

1. quadratojugal joined to the quadrate by a ligament,
2. quadratojugal-squamosal contact absent, and
3. obturator process of the ischium reduced or absent.

(Ji *et al.*, 1998, p.759 and the supplementary information made available on Nature's web site, http://www.nature.com). Yet, the interpretation of each of these features is open to question.

One expert has stated that he was unable to find evidence in *Caudipteryx* of suturing between the quadratojugal and quadrate (which suggests they were joined by a ligament). The quadratojugal appeared to him to be nearly identical to that of *Archæopteryx*. He also believes that Ji *et al.* probably had the ischium upside down and consequently misconstrued the ischial process as a ventral rather than a dorsal structure (personal communication). If that is correct, the ischial process supports rather than opposes avian status.

Such disagreements among experts reveal that fossil interpretation is more subjective than is commonly appreciated. As J. M. Clark noted in his review of H.-P. Schultze and L. Trueb, eds., *Origins of the Higher Groups of Tetrapods*, (Cornell University Press, Ithaca, NY. 1991), 'the book again and again demonstrates that similarity lies in the eye of the beholder, and that the particular hypothesis being advocated strongly colours perceptions of morphological resemblance' (Clark, 1992, cited in Feduccia, 1996, p.59). Given that a 'feathered dinosaur' is the holy grail of theropod advocates, there is certainly reason for caution regarding the theropodists' disputed interpretations of these fossils. After all, it was zeal for the theropod hypothesis that prompted the premature characterization of the fibrous structures on *Sinosauropteryx* as 'downy feathers'.[14]

As for the claim that the quadratojugal of *Caudipteryx* contacted the squamosal, the squamosal was apparently not preserved. It is not mentioned in the description of the skull and is not shown in the relevant diagram. The fact Ji *et al.* (1998, p.754) state that 'the tall quadratojugal *seems to have* contacted the squamosal' suggests strongly that this is a matter of inference rather than observation (emphasis supplied).

Even if these features were correctly diagnosed by Ji *et al.* that would not mean *Caudipteryx* was a dinosaur.

(Padian, 1998, p.730). Regarding their presumed inability to fly, see Monastersky, 1998; Chen *et al.*, 1998, pp.151–152. One detects, however, some equivocation on the flightlessness of *Protarchæopteryx*. Thus, Ackerman reports that *Protarchæopteryx* '*probably* could not have achieved true powered flight' (emphasis supplied) (Ackerman, 1998, p.90). According to Feduccia, *Protarchæopteryx* is within the range of living volant birds (reliable source).

[12] After describing briefly the complexity of feathers, Fastovsky and Weishampel state, 'The importance of all this in an evolutionary sense is that *feathers evolved (or originated) only once*. After all, what are the chances of so complex a structure's having evolved more than once? Using parsimony, we must conclude that feathers evolved only one time.' (Fastovsky and Weishampel, 1996, p.294). Peter Wellnhofer agrees it is unlikely that a feature as unusual as feathers evolved twice. (Gibbons, 1996a).

[13] Ruben's opinion is based on a reliable source. All three have examined the fossils.

[14] Theropod bias was also evident in Padian and Chiappe (1998a). A subsequent letter by the original describers of *Confuciusornis* (Feduccia, Martin, Zhou, and Hou) charged that the cover illustration of *Confuciusornis* made it look more dinosaurian than it was. They wrote, 'Although *Confuciusornis* is a primitive, sauriurine bird, in life it would have appeared very much like a normal perching bird, such as a small crow, not a feathered dinosaur. The cover illustration has nothing to do with *Confuciusornis*.' (Feduccia *et al.*, 1998).

Putting aside the matter of feathers, *Caudipteryx* has a number of characters that point to its avian status. Ji *et al.* include one such character in their phylogenetic matrix,[15] but other experts believe there are more. They cite such things as the shortened tail with distal fusion, the reduced fibula, the ventral occiput, the long premaxilla relative to the maxilla, the reduced and edentulous (toothless) maxilla, the edentulous dentary, the small, moveable head of the quadrate, the absence of a pubic foot, and the rounded, ball-like head of the femur (personal communication).

When *Caudipteryx* was first reported, all theropods were considered 'irredeemable carnivores' (Fastovsky and Weishampel, 1996, pp. 261,284–287). *Caudipteryx*, on the other hand, was apparently an herbivore. Not only were its maxilla and dentary edentulous, but both specimens of the creature included large masses of gastroliths ('gizzard stones'), which are used for grinding plant matter (see Ji *et al.*, 1998, p.759).[16] Because herbivory and gastroliths were both known in Avialæ but neither was known in any of the scores of theropod genera,[17] their presence in *Caudipteryx* seemed suggestive of avian status. Gastroliths have since been reported in an ornithomimid species from the Upper Cretaceous, so this particular argument for avian status is no longer available (Kobayashi *et al.*, 1999).[18]

It is difficult to accept that the long hand-feathers of *Caudipteryx* evolved within (nonavian) Maniraptora. The strong, grasping hands of maniraptorans were an essential part of their weaponry (Fastovsky and Weishampel, 1996, pp.282–283), but the well-formed feathers attached to *Caudipteryx's* middle finger would prevent the hand from being used as a grasping organ. What possible selective advantage could be bestowed on a cursorial predator by the development of hand-feathers that disable the function of one of its primary weapons?

The anticipated retort that the loss of use caused by the development of hand-feathers coincided with and perhaps drove the shift to herbivory does not address the real problem. One still must explain how the survival advantage of developing hand-feathers on a maniraptoran would exceed the survival disadvantage from the concurrent impairment of the grasping function. A shift to an herbivorous diet may well reduce the degree of disadvantage resulting from impairment of the hand, but unless the feathers provided a net *advantage* to survival at each step in their development, they would never become established in the population.

If, on the other hand, *Caudipteryx* was a secondarily flightless bird, there is no need to conjure up an explanation of how long hand-feathers on a maniraptoran could provide a net survival advantage. Those feathers would be vestigial flight structures.[19]

Ji *et al.* considered *Protarchæopteryx* to be more 'primitive' than *Caudipteryx* because it reportedly lacked the following 'derived' features shared by *Caudipteryx* and *Archæopteryx*:

1. frontal process of premaxilla relatively long to very long, and
2. teeth with unserrated crowns.

(Ji *et al.*, 1998, p.759 and the supplementary information made available on Nature's web site, http://www.nature.com).[20] But again, other experts were unable to confirm these features in the fossils. Moreover, these experts found additional characters, such as the absence of a pubic foot, which point to *Protarchæopteryx's* avian status (personal communication).

Apart from the alleged serrations, the short, bulbous maxillary and dentary teeth of *Protarchæopteryx* look remarkably like those of *Archæopteryx*, complete with waisted crowns (Ji *et al.*, 1998, pp.753,755; compare drawing at Feduccia, 1996, p.80). Perhaps this is one of the features that led Ji Qiang and Ji Shu-An to conclude originally that *Protarchæopteryx* bore a striking resemblance to *Archæopteryx*. Velociraptorine teeth, on the other hand, are laterally compressed so as to be bladelike (as are the teeth of all dromæosaurids) (Ostrom, 1990, pp.270–271).

Even if serrations are present, it is clear from the report that they are quite unlike the serrations in dromæosaurids. Ji *et al.* state there were 35–50 serrations per 5 mm, but the number of serrations in dromæosaurids is only 16–18 per 5 mm (Ji *et al.*, 1998, p.753; Feduccia, 1996, p.80).[21] The serrations, therefore, do not support the contention that these teeth were inherited from the ancestor of dromæosaurids. *Protarchæopteryx's* teeth look nothing like those of dromæosaurids.

Ji *et al.* acknowledged that in one feature *Protarchæopteryx* and *Caudipteryx* were more like modern birds than was *Archæopteryx* (see note 15). This means, according to the proposed phylogenetic positioning of *Protarchæopteryx*, that this feature was either *(a)* developed in *Protarchæopteryx* after it split from the lineage leading to dromæosaurids or *(b)* was lost in the dromæosaurid lineage after *Protarchæopteryx* split (since it is not present in Dromæosauridæ). (The same holds for each of the derived avian features suggested by other experts.)

If option *(a)* is correct, then *Caudipteryx* did not inherit this feature from a common ancestor with *Protarchæopteryx*. That means the feature evolved independently in both *Protarchæopteryx* and *Caudipteryx*. It then evolved independently a third time within Avialæ at some point after *Archæopteryx* (since it is a derived avian character not present in *Archæopteryx*). If the feature is so advantageous that it evolved these three separate times, it seems most

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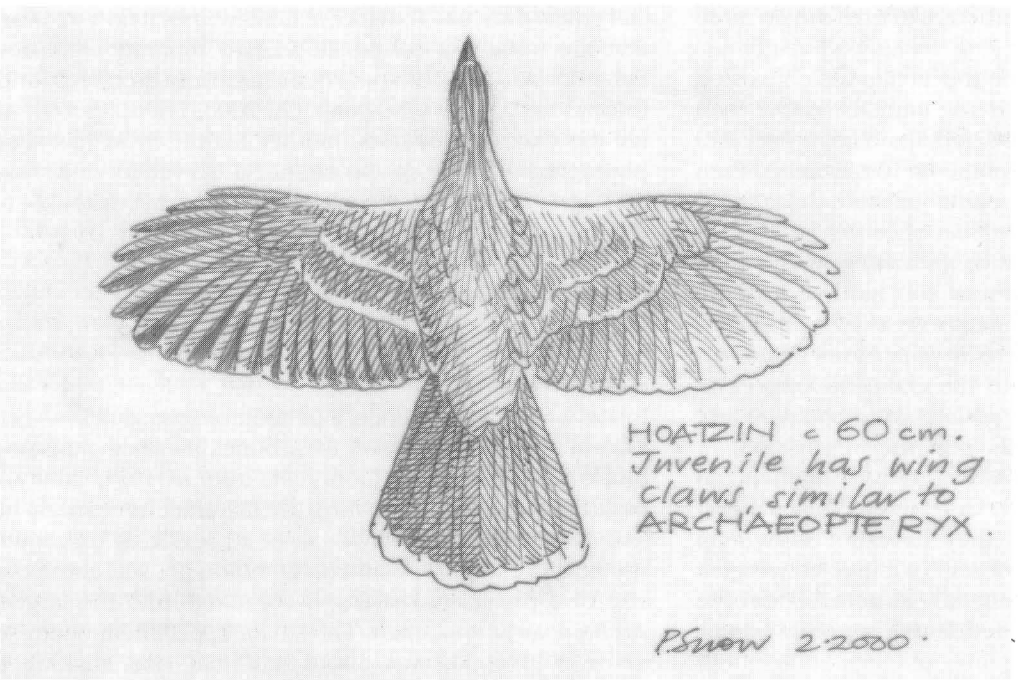
[15] According to the matrix provided as supplementary information on Nature's web site http://www.nature.com, *Protarchæopteryx* and *Caudipteryx* shared the derived avian feature of a radial shaft to ulnar shaft ratio that was smaller than 0·70 (character 49), whereas *Archæopteryx* did not.

[16] Fastovsky and Weishampel define a gastrolith as a 'smoothly polished stone in the stomach, used for grinding plant matter.' (Fastovsky and Weishampel, 1996, p.435). Masses of gastroliths similar to those in *Caudipteryx* have been found in moas, a group of extinct, leaf-eating birds in New Zealand. (Feduccia, 1996, pp.5, 281–283).

[17] Gastroliths were known in some birds, crocodilians, sauropodomorphs, and psittacosaurs. (Fastovsky and Weishampel, 1996, pp.125, 182 (n. 6), 254–255.

[18] The authors reason from phylogenetic analysis that herbivory evolved independently in the ornithomimid species and in *Caudipteryx*.


HOATZIN c 60 cm.
Juvenile has wing claws, similar to ARCHAEOPTERYX.
P.Snow 2.2000.

unlikely that it would have been lost in the lineage leading to *Archæopteryx*. If, however, *Protarchæopteryx* and *Caudipteryx* were secondarily flightless birds, then the feature need have evolved only once after *Archæopteryx*.

If option *(b)* is correct, then *Caudipteryx* could have inherited this feature from a common ancestor with *Protarchæopteryx*. If so, then the feature evolved independently only one other time, within Avialæ at some point after *Archæopteryx*. That scenario, however, raises the question of why a feature so advantageous that it evolved on both sides of *Archæopteryx* would have been lost in both the dromæosaurid lineage and in the lineage leading to *Archæopteryx*. Again, if *Protarchæopteryx* and *Caudipteryx* were secondarily flightless birds, this difficulty is removed.

The proposed positioning of *Protarchæopteryx* and *Caudipteryx* on the phylogenetic tree also implies that feathers were a universal feature of dromæosaurids (Padian, 1998, p.729). Yet, no dromæosaurid has been found with any evidence of feathers. The recently reported dromæosaurid *Sinornithosaurus* shows evidence of filaments, which some theropod advocates have hastily characterized as 'protofeathers' and 'downy feathers' (Sloan, 1999, pp.103,105), but in the words of Storrs L. Olson, Curator of Birds at the Smithsonian Institution, this 'is little more than wishful thinking that has been presented as fact' (Olson, 1999). Apparently the *Sinosauropteryx* affair has done little to instill caution in the theropod faithful.

The absence of feathers on dromæosaurids is admittedly negative evidence, but one wonders if feathers are as difficult to preserve as is often speculated. Feather impressions are visible on all seven of the *Archæopteryx* specimens, whereas an ossified sternum was preserved in only one (Feduccia, 1996, pp.24–35). Feathers were also found with *Confuciusornis*, *Ambiortus*, *Noguerornis*, and numerous other fossil birds, not to mention the only known specimens of *Protarchæopteryx* and *Caudipteryx*.[22] If dromæosaurids did have feathers, it is most unfortunate for the theropod position that no trace of them was preserved on any of the more than 20 individual creatures that have been unearthed (Ostrom, 1990, p.270).

There are thus ample grounds for believing that *Protarchæopteryx* and *Caudipteryx* are extinct birds rather than dinosaurs. The rush to a contrary judgment has more to do with a prior commitment to theropod ancestry than with the weight of the evidence. These creatures have been pronounced dinosaurs because that is what many people want them to be.

Recent finds: Round 2

Since the discovery of *Protarchæopteryx* and *Caudipteryx*, two filament-bearing dinosaurs from the Yixian Formation in China (middle Early Cretaceous) have been reported in the formal scientific literature: a quite fragmentary seven-foot-long therizinosaur dubbed *Beipiaosaurus inexpectus* (Xing *et al.*, 1999a) and an eagle-size dromæosaurid (mentioned above) dubbed *Sinornithosaurus millenii* (Xing *et al.*, 1999b). Theropod advocates suggest that these filaments represent an early stage in the development of feathers and thus link theropods to avian ancestry, but this is pure speculation. As Dr. Olson put it in his recent open letter, 'the statement [in Sloan, 1999] that *hollow, hairlike structures characterize protofeathers* is nonsense considering that protofeathers exist only as a theoretical

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[19] Another possibility, open to creationists, is that (at least some) land birds were descendants of an originally created kind whose members were given feathers for some purpose(s) other than flight (perhaps for one or more of the purposes theropodists use in arguing that feathers evolved, *e.g.*, insulation, camouflage, or display).

[20] Ji *et al.* do not claim that *Protarchæopteryx* had an obturator process or that its quadratojugal contacted the squamosal. These features admittedly could not be determined.

[21] The chart in Feduccia (from Chatterjee) lists *Deinonychus* and *Dromæosaurus*. Since Currie does not include the number of serrations among the dental distinctions between velociraptorines and dromæosaurines, they presumably do not vary significantly in that regard. (Currie, 1997b, p.195).

[22] Regarding *Confuciusornis*, *Ambiortus*, and *Noguerornis*, see Feduccia (1996, pp.139–145).

construct, so that the internal structure of one is even more hypothetical' (Olson, 1999).

Moreover, if the filaments on the Yixian fossils existed as external structures on the living animals, rather than being the result of a peculiar (perhaps Yixian specific) breakdown of tissue in the course of fossilization, then these filamentous structures either existed throughout Coelurosauria or evolved more than once (since they are present in the compsognathid *Sinosauropteryx*). If they existed throughout Coelurosauria, it is hard to imagine why they are not present in such exquisitely preserved cœlurosaurs as *Compsognathus longipes* and *Scipionyx samniticus*. And if, contrary to the claim of Xing *et al.* (1999a), therizinosaurs (such as *Beipiaosaurus*) are not nested within Coelurosauria (see the discussion of therizinosaurs in subsection 2 below), then the filamentous structures are even more widely distributed. This makes it an even greater mystery why they have not shown up elsewhere. Of course, one can wave the wand of 'convergent evolution' and have filamentous structures evolve independently as often as needed, but this rapidly begins to look contrived.

The theropod faithful, undaunted by these issues, claim (in the recent exhibit at the National Geographic Society) 'there is strong evidence that a wide variety of carnivorous dinosaurs had feathers' and depict *Deinonychus* and baby tyrannosaurs as having feathers. Dr. Olson labels the claim 'spurious' and says the depictions are 'simply imaginary and [have] no place outside of science fiction' (Olson, 1999).

An interesting aspect of *Sinornithosaurus* is that, in numerous features, it is allegedly the most birdlike of all nonavian theropods. Since it is the oldest known dromæosaurid, predating *Deinonychus* by some 14 million years, one is left to wonder why certain birdlike features are absent in *Deinonychus*, only to reappear in dromæosaurids some 75 million years later (see note 28). It seems *ad hoc* to claim that avian features first provided a selective advantage for dromæosaurids (resulting in *Sinornithosaurus*), then nonavian features provided a selective advantage (resulting in *Deinonychus*), and then avian features once again provided a selective advantage (resulting in the birdlike dromæosaurids of the Late Cretaceous).

Another 'feathered theropod', dubbed *Archæoraptor liaoningensis*, has been reported in the popular press (Sloan, 1999) but has not yet been published in a formal scientific journal. Though bold claims were made for this fossil, Larry Martin says it 'is one of the worst preserved specimens in a long line of poorly preserved specimens'. It is what is facetiously referred to as 'palæontological road kill', a specimen so compressed that interpretation will be extremely difficult. To make matters worse, it now appears that the fossil is a composite of two separate creatures. Someone added to the specimen a tail from a dromæosaurid! (Monastersky, 2000; Kurtenbach, 2000; Friend, 2000). As for the claim of feathers, neither Martin, who has seen photographs of the specimen, nor a University of Kansas colleague of his, who viewed the actual fossil, was able to identify any feather impressions (Monastersky, 1999).

Some issues beyond the recent finds

1. *Protoavis texensis*

In 1983, Sankar Chatterjee, a palæontologist at Texas Tech University, discovered some fossil bones in a small mudstone block dating to 225 million years ago. In 1985, after six months of carefully preparing the material, he realized he had discovered two individuals of a previously unknown species. The larger specimen, the holotype, was about the size of a pheasant, making it comparable to the largest *Archæopteryx* specimen. The smaller specimen, believed to be a juvenile, was about half that size, making it comparable to the smallest *Archæopteryx* specimen. Since then, Chatterjee has collected 31 isolated postcranial elements, which have been referred to this species. 'Nearly every skeletal element is represented among these specimens' (Chatterjee, 1997, pp.33–38; on the sizes of the *Archæopteryx* specimens, see also note 3).

The species, later dubbed *Protoavis texensis*, predates *Archæopteryx* by about 75 million years and, as described by Chatterjee, is more like modern birds than is *Archæopteryx*. It has a V-shaped furcula, a keeled sternum, quill knobs in the hand for attachment of flight feathers, birdlike cervical vertebræ, and a birdlike skull, pelvis and pectoral apparatus. As Feduccia admits, 'The features Chatterjee illustrates are without question quite birdlike, and an early bird from the late Triassic is certainly possible' (Feduccia, 1996, p.38. For first-hand descriptions, see Chatterjee, 1991, 1995 and 1997).

Regarding *Protavis's* flight capability, Chatterjee writes:

> *Protoavis* shows many derived features associated with flapping flight that are not encountered in *Archæopteryx*. Of particular importance are the keeled sternum, hypocleidium-bearing furcula, strut-like coracoid, large flight muscles, and triosseal canal for the supracoracoideus tendon ... The glenoid cavity faces dorsolaterally, which permits unrestricted movements of the humerus in all directions. The humerus is an exceptionally strong bone and shows all the bumps and ridges for the attachment of flight muscles. The specialized linkage system of elbow and wrist joints would stiffen the entire extended wing into a plane to resist twisting

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23 In a bit of an overstatement, Padian and Chiappe claim 'it has become nearly universally accepted that birds evolved from small carnivorous dinosaurs most closely related to Dromæsaurids, probably sometime in the Middle to early Late Jurassic.' (Padian and Chiappe, 1997, p.71). Elsewhere they write, 'The reported find of *Protoavis*, deep in the Late Triassic, was stratigraphically unexpected given the consilience between the order of the bird-theropod cladogram (*e.g.* Gauthier, 1986) and the sequence of appearance of these taxa, which suggested that the origin of birds was in the Late (or perhaps Middle) Jurassic (Padian, 1985; Gauthier, 1986).' (Padian and Chiappe, 1998b, pp.12–13).

when exposed to air pressure during flight. The presence of feathers is inferred indirectly from the development of quill knobs in the hand. The furcula and keeled sternum must have accommodated large flight muscles. The flexible furcula would act as a spring between the shoulder joints during the flight strokes. The presence of a triosseal canal suggests that the supracoracoideus muscle must have functioned effectively as a wing elevator and that the animal could possibly take off from the ground. The enlargement and partial fusion of pelvic bones, a relatively short horizontal femur with antitrochanter articulation, and mesotarsal ankle joint all may indicate that the hindlimb was modified as a landing gear. (Chatterjee, 1997, pp. 79–80).

Given that the prevailing view of bird origins (the theropod theory) was developed with the assumption that *Archæopteryx* was a very early bird and that birds therefore arose in the Middle to early Late Jurassic, the reaction to *Protoavis texensis* was predictable.[23] The discovery touched off what Feduccia describes as 'a tremendously bitter and acrimonious controversy' that was laced 'with sharp personal attacks' (Feduccia, 1996, p.38). Chatterjee's published descriptions of the material seem to have mollified his opponents, but his interpretations continue to meet resistance. His find is slighted by such remarks as: 'The material has become a palæontological Rorschach test of one's training, theoretical bias, and predisposition' (Padian and Chiappe, 1998b, p.13).

Another method used to dismiss *Protoavis* is to claim that any conclusions about it are premature until 'the palæontological community has had adequate opportunity to evaluate the *Protoavis* material' so as to 'test the original observations and conclusions, and to draw their own.' One is told that until then 'all claims [about *Protoavis*] must be treated tentatively, *especially in view of the paradoxes it presents*' (Padian and Chiappe, 1998b, p.13; emphasis supplied). This rule obviously has been suspended in the case of the so-called 'feathered theropods', but in any event, one should not get the impression that Chatterjee is alone in his assessment. As Lawrence Witmer recently pointed out, 'such esteemed palæornithologists as Evgeny Kurochkin and D. Stephen Peters have regarded *Protoavis* as a bird in their published accounts of early avian evolution' (Chatterjee, 1997). Likewise, Chatterjee reports, 'Many experts on fossil birds came to our museum and confirmed my belief that the newly found material exhibited a suite of distinct avian traits' (Chatterjee, 1997, p.37).

It is noteworthy in this context that several researchers have reported probable bird tracks from the Late Triassic to Early Jurassic. In 1974 Ellenberger presented as avian a variety of Late Triassic-Early Jurassic footprints from Africa, and in 1992 Lockley *et al.* reported on Early Jurassic birdlike tracks from northern Africa and North America (Chiappe, 1995, p.349. See Ellenberger, 1974 and Lockley *et al.*, 1992). In 1993 Weems and Kimmel described tracks from a *Protoavis*-like bird from the Late Triassic of Virginia (Chatterjee, 1997, p.137. See Weems and Kimmel, 1993).

Advocates of theropod ancestry admit that 'these footprints deserve serious consideration,' but they are unwilling to consider them avian in the absence of '*reliable* osteological evidence before the Late Jurassic' (Chiappe, 1995, p.349, referring to Ellenberger, 1974 and Lockley *et al.*, 1992; emphasis supplied). So rather than see these footprints as supporting Chatterjee's interpretation of the *Protoavis* material by showing the presence of birds in the Late Triassic or Early Jurassic, scepticism about Chatterjee's interpretation, which is spawned in part by the implications of that interpretation, is used to deny the significance of the footprints.

A Late Triassic bird that is more modern than *Archæopteryx* puts a fatal strain on the theropod theory. It pushes the origin of birds back at least to the Middle Triassic, before the time of *Eoraptor*, the earliest known dinosaur (Fastovsky and Weishampel, 1996, p.365).[24] Cœlurosaurs and dromæosaurids, those dinosaurs believed to be anatomically similar to birds, first appear some 80 and 105 million years, respectively, after the Middle Triassic (see note 28). To maintain the theropod theory in the face of this, its proponents must claim not only that dinosaurs existed in the Middle Triassic but that by that time they had also diversified into the various theropod clades and had evolved into birds, all without leaving a trace! As Witmer concedes, if that were so, 'we should reasonably expect to find Triassic representatives of the ornithomimid, tyrannosaurid, troodontid, and dromæosaurid clades, among others' (Chatterjee, 1997).[25]

Of course, if dinosaurs are eliminated as ancestral candidates, something else will be put in their place. Evolution abhors ancestral vacuums. It will, however, be a powerful demonstration of how deceiving cladistic analysis can be. The fact two groups of creatures uniquely share similarities need not mean that they inherited those similarities from a common ancestor. The similarities may be due to convergent evolution, to creative design, or to some combination of the two.

2. Too late

Accepting *Archæopteryx* as the earliest known bird by no means solves the timing problem posed by the theropod theory of origins. Since *Archæopteryx* dates to the Late Jurassic, some 150 million years ago, birds presumably originated quite a bit earlier. Even advocates of theropod ancestry place the rise of birds in the Middle to early Late

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[24] There is some question, however, whether *Eoraptor* is a dinosaur. If not, then the earliest known dinosaur is *Herrerasaurus*, also from the Late Triassic of Argentina. (Feduccia, 1996, p.90). The Middle Triassic date is calculated from the fact that the origin of birds is believed by theropod advocates to have preceded *Archæopteryx* by some 10–15 million years (see note 26). Since *Protoavis* is more derived, it would require even more time to evolve.

[25] One can only marvel at Currie's faith in the theropod theory. He writes, 'If birds were present during the Late Triassic, then theropods are *less likely* to have been ancestral to birds' (emphasis supplied). (Currie, 1997a, p.231).

Jurassic (Padian and Chiappe, 1997, p.71).[26] This means that the alleged dinosaur ancestor must have existed by at least the Middle Jurassic.[27] The problem is that no dinosaur with particularly avian affinities is known before the Late Jurassic, and those with the most birdlike characteristics do not appear until much later.[28] This pattern has led some experts to suggest the possibility that cœlurosaurs were derived from primitive birds (archæopterygids)! (Fallow, 1997, pp.108–110; Feduccia, 1996, p.90).

The recent claim that an Early Jurassic jaw fragment (with two teeth) is that of a therizinosauroid (and thus that of a coelurosaur) does not solve this problem (Zhao and Xing, 1998).[29] First, the specimen is too fragmentary to permit a confident diagnosis. Convergence is believed to be 'very common',[30] so the most one can say is that this jaw fragment is consistent with that of a therizinosaur.

Second, since this jaw fragment allegedly predates the next oldest therizinosaur by some 94 million years, even if one assumes it belonged to a creature in the therizinosaur lineage, it would be a leap to conclude that such an ancient ancestor possessed the essential features of the later forms. Nothing in evolutionary theory excludes the possibility that the jaw features developed in the lineage before those features by which the group is included within Coelurosauria. So until coelurosaurian features are documented in such early members of the lineage, their presence remains an assumption.

Third, it is not at all clear that even the later therizinosaurs should be included in Coelurosauria. Fastovsky and Weishampel report that segnosaurs (see note 29) 'have been likened to an offspring of a *ménage à trois* involving a theropod, a prosauropod, and an ornithischian' (Fastovsky and Weishampel, 1996, p.226). It is therefore no surprise that experts have variously allied them with prosauropods, ornithischians, and sauropodomorphs. Though some have recently allied them with 'the large, strange, and poorly understood theropod *Therizinosaurus*,' thus placing them within Theropoda, Fastovsky and Weishampel caution, 'Only time and more fossils will unravel the true affinities of these strange animals' (Fastovsky and Weishampel, 1996, p.228. See also Glut, 1997, p.55).[31]

Finally, even if therizinosaurs deserve to be included within Coelurosauria, cœlurosaurs below Maniraptora are not particularly strong candidates for avian ancestors. This is evident from the fact that, though cœlurosaurs have long been known, the theropod theory of ancestry did not take hold until the mid–1970's, after the discovery of the dromæosaurid *Deinonychus*. Only in Maniraptora did the number of avian features reach the 'critical mass' necessary to persuade a majority that they were not the result of convergence (see note 5).

The Middle Jurassic teeth that have been *tentatively* identified as dromæosaurid fail to solve this timing problem for some of the same reasons.[32] Even if the teeth had clear dromæosaurid morphology, it would be impossible to know whether they actually belonged to a dromæosaurid. To draw that conclusion, one would have to assume that no other creature had the same type teeth. And even if one assumes the teeth belonged to a creature in the dromæosaurid lineage, one could not know whether such an ancient representative possessed the avian features present in those forms dated some 50 million years later.

Padian and Chiappe seem to think the issue of timing has only to do with the late appearance of dromæosaurids relative to birds, their putative 'sister group' (*i.e.*, the group believed to be most closely related). They frame the problem this way:

> A difficulty regarded as insurmountable by opponents of the theropod origin of birds (*e.g.* Feduccia, 1996) is the presumption that the taxa identified as closest to *Archæopteryx* among theropods—the dromæosaurids—do not appear in the fossil record until Albian–Aptian times (perhaps 110 million years ago: *Deinonychus*, Cloverly Formation, Wyoming), whereas *Archæopteryx* comes from Late Jurassic (Tithonian) times (about 150 million years ago) (Padian and Chiappe, 1998, p.14).[33]

But this ignores the important point that the known dinosaurs from the assumed ancestral time lack the characteristics that are used to unite birds and dinosaurs (Feduccia, 1996, p.90).[34] In other words, the problem is not simply that the putative sister groups (dromæosaurids and birds) appear with such a large stagger, but also that no dinosaur old enough to qualify as an ancestor of birds has the particularly birdlike traits on which the claim of dinosaurian ancestry is based.

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[26] Others (without regard to *Protoavis*) claim that birds may have arisen as early as the Middle Triassic. (Feduccia, 1996, p.90).

[27] Ostrom states it this way: 'The evidence strongly indicates a close phyletic relationship between dromæosaurids and primitive birds, and one could argue that an (as yet unknown) Early or Mid-Jurassic dromæosaurid was ancestral to archæopterygians and later birds.' (Ostrom, 1990, p.276).

[28] The earliest known cœlurosaurs, *Compsognathus*, *Coelurus*, and *Ornitholestes*, are all from the Late Jurassic. The earliest known dromæosaurid, *Sinornithosaurus*, is from the middle Early Cretaceous, some 25 million years later. (Xing *et al.*, 1999b). *Deinonychus*, the next oldest dromæosaurid, is from the late Early Cretaceous. With the exception of *Sinornithosaurus*, the most birdlike dromæosaurids are from the Late Cretaceous, some 75 million years after *Deinonychus*. (Feduccia, 1996, p.90; Padian and Chiappe, 1997, p.78; Hutchinson and Padian, 1997, p.132; Benton, 1993, pp.699, 702). A distal radius and femur from the Late Jurassic were re-identified by Jensen and Padian in 1989 as belonging to the clade Maniraptora, but no determination was made whether they were from a dromæosaurid or a bird (Jensen and Padian, 1989). Some teeth from Japan that have been attributed to Dromæosauridæ may be older than *Deinonychus*, but the dating is disputed. Some 'dromæosaurid/troodontid-type' teeth from the late Middle Jurassic of England have also been noted (see discussion in text). (Benton, 1993, p.702).

[29] According to one recent classification, Therizinosauroidea is a superfamily consisting of the families Alxasauridæ (consisting of the genus *Alxasaurus*) and Therizinosauridæ (consisting of the genera *Enigmosaurus*, *Erlikosaurus*, *Nanshiungosaurus*, *Segnosaurus*, and *Therizinosaurus*). (Glut, 1997, pp.55–56). The genera *Alxasaurus*, *Enigmosaurus*, *Erlikosaurus*, *Nanshiungosaurus*, and *Segnosaurus* are also known as Segnosauria. (Fastovsky and Weishampel, 1996, pp.226–227).

[30] 'Biologists working with both modern and extinct groups argue that convergence is very common.' (Carroll, 1988, p.8). A classic example

In the end, the response to this and all timing objections is an appeal to the inadequacy of the fossil record. One must believe that, in the case of birdlike dinosaurs, the vagaries of fossilization and discovery have conspired to create a false picture.[35] Yet, as Feduccia points out, 'we have a wonderfully preserved array of fossil reptiles from the Triassic, Jurassic, and Cretaceous periods' (Feduccia, 1996, p.56). Benton lists from the Jurassic and Cretaceous some 98 families of terrestrial reptiles, 49 families of terrestrial mammals, and 29 families of birds (Benton, 1993, pp.681–711, 739–768). This translates into hundreds of genera and thousands of species. One cannot, of course, disprove a negative, but the evidence seems sufficient to create, within an evolutionist framework, a presumption that the hypothesized ancestral theropods did not exist at the required time.

As for the late appearance of dromæosaurids, Padian and Chiappe admit it is 'puzzling', but they deny its significance on the basis that the Mesozoic fossil record frequently contains large disjunctions in the appearance of sister groups. They state:

> For example, although stegosaurs and ankylosaurs are regarded as sister taxa that must have diverged by the late Early Jurassic, stegosaurs are not known before the Bathonian-Callovian (approximately 170 mya), whereas before the 1980's, ankylosaurs were not known before the Aptian–Albian (approximately 110 mya; Weishampel, *et al.*, 1990). The situation is not unique to dinosaurs. No one doubts today that marsupials and placentals are sister taxa within mammals, and monotremes are their sister taxon. Hence, the split between therians (marsupials + placentals) and monotremes must have taken place before the first recognizable marsupials and placentals evolved. However, the first marsupials and placentals are known from Early Cretaceous times (approximately 100 mya), whereas until recently, monotremes were not known until the Oligocene (approximately 20 mya), a disjunction of 80 million years—over twice that between *Archæopteryx* and *Deinonychus* (Carroll, 1988)! (Padian and Chiappe, 1997, p.78).

Padian and Chiappe are saying to their *evolutionist* opponents that since they accept other disjunctions in the appearance of sister groups, it is inconsistent for them to complain about this one. This, of course, has nothing to do with the merits of the complaint, with whether the disjunction is relevant to the claim of ancestry. (Indeed, Padian and Chiappe acknowledge its probative value when they say the absence of earlier dromæosaurids is 'puzzling,' *i.e.*, difficult to explain. Witmer describes the problem as 'vexing' (Chatterjee, 1997)). It is, rather, an attempt to bar certain parties, in this case evolutionists, from raising the issue. In law, this is known as an estoppel argument.

This argument loses its force when directed against those who do not accept megaevolution. They cannot be charged with inconsistency in raising the complaint. Such critics agree it is 'puzzling' for sister taxa to appear 40 million years apart and believe such stratigraphic disjunctions indicate that the groups have been misconstrued as sister taxa.[36]

Padian and Chiappe apparently recognize the weakness of simply declaring the late appearance of dromæosaurids to be irrelevant, so they argue in the alternative that small maniraptorans are in fact known from the Late Jurassic (Padian and Chiappe, 1997, p.78). But this is not helpful, since birds are classified as maniraptorans and the bones in question (a distal radius and a femur) were described as possibly belonging to a bird (see note 28). So Padian and Chiappe are left to weakly claim: 'These bones unfortunately could not be identified to the generic level but nonetheless indicated that *if they are not bones of birds*, then they are certainly those of their sister taxon, the dromæosaurids' (Padian and Chiappe, 1997, p.78, emphasis supplied). If the stratigraphic disjunction between birds and dromæosaurids is a genuine non-issue, one wonders why these experts are willing to stretch so far to find a Jurassic dromæosaurid.

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is *Thylacinus*, a marsupial 'wolf,' and the placental canids. Carroll says, 'The general body form of *Thylacinus* as well as *details of the dentition* provide a *strikingly close parallel* with the placental canids' (emphasis supplied) (Carroll, 1988, p.435).

[31] The recently discovered *Beipiaosaurus inexpectus* has been interpreted as a primitive therizinosaur. (Xing *et al.*, 1999a; Sloan, 1999, pp.103, 106). The authors believe it has features that show therizinosaurs to be coelurosaurian theropods.

[32] Zhao and Xing state, 'Isolated teeth *tentatively* identified as dromæosaurid have been found in Middle Jurassic deposits' (emphasis supplied) (Zhao and Xing, 1998, p.235). Benton refers to teeth from the late Middle Jurassic as 'dromæosaurid/troodontid-type' (Benton, 1993, p.702).

[33] Padian and Chiappe would now view *Caudipteryx* as the 'sister group' of birds, but as previously discussed, *Caudipteryx* is probably a flightless bird.

[34] He writes: 'First, the timing is off. *Archæopteryx* occurs in the late Jurassic, some 150 million years ago, and presumably birds originated much earlier, say, possibly medial to late Triassic. However, the earliest dinosaurs, *Eoraptor* (if it is a dinosaur) and *Herrerasaurus* [citations omitted], both from the late Triassic of Argentina, *lack the synapomorphies that are used to unite birds and dinosaurs*' (emphasis supplied). The same holds for Middle Jurassic dinosaurs.

[35] The desperation is palpable in the claim that the middle Early Cretaceous Yixian Formation is a 'refugium for relicts', a pocket of evolutionary holdovers, none of which left evidence of its existence during the preceding ages. (Zhexi, 1999). Zhexi understates the difficulty of his position by suggesting that the 'ghost lineages' of the Yixian 'relicts' extend back to the Late Jurassic (some 25 million years). Without even considering *Protoavis*, to qualify as ancestors of birds the 'ghost lineages' of the Yixian theropods would need to extend back at least to the Middle Jurassic, another 25 million years.

[36] Of course, creationists have their own problems regarding the fossil record, but explaining how evolutionary lineages could exist for tens of millions of years without leaving a clear trace is not one of them.

3. Too specialized

In all the talk about shared anatomical traits and 'sister groups,' it is easy to lose sight of the fact that, even if they were old enough, all known cœlurosaurs are too specialized to have been actual ancestors of birds. In other words, they have features believed to have arisen in their lineage after it split from the lineage leading to birds, which features disqualify them as actual ancestors. Thus, after explaining that *Compsognathus* could not be ancestral to *Archæopteryx* because of its date and its specialization, Carroll says, 'No other adequately known theropod appears to be an appropriate ancestor' (Carroll, 1988, p.340).

Even dromæosaurids are not claimed to be suitable ancestors of birds but merely the best approximation, based on speculation from cladistic analysis, of what the hypothetical bird ancestor would look like (Chatterjee, 1997, p.7–8).[37] It is admitted that 'in some characters, such as the stiffened tail, dromæosaurids are too specialized to have been good ancestors for birds' (Currie, 1997b, p.195). Indeed, the smallest known dromæosaurid (other than the eagle-size *Sinornithosaurus*, for which no weight estimate is available) is estimated to have weighed 66 pounds, compared to a mere one pound for the largest *Archæopteryx* specimen (see notes 3 and 6).

One can include among these characters the most conspicuous feature of dromæosaurids: the large, raptorial claw on the second toe of the hind foot. This feature almost certainly was not present in the alleged common ancestor of birds and dromæosaurids, as it is not present in *Archæopteryx*, the basal bird, or in any of the other early birds (including *Protarchæopteryx* and *Caudipteryx*). It is a specialization that moves dromæosaurids away from the actual avian lineage.

It is thus difficult to understand how the presence of such a claw in *Rahonavis ostromi* can be considered 'a pretty clear link to its dinosaur origins' (Zimmer, 1998, p.32, quoting Catherine Forster).[38] Given that birds are believed to be monophyletic and that the raptorial claw is not present in the basal members of the group, the appearance of the feature in more derived birds must, from an evolutionist perspective, be due to convergent evolution (as is believed to have occurred in troodontids) (Fastovsky and Weishampel, 1996, pp.278–279). It thus does nothing to link birds to dinosaurs.

The alternative is to claim that the claw is the primitive condition in Avialæ. Without even considering *Protoavis*, that would require one to hypothesize an undetected lineage of sickle-clawed birds extending some 85 million years, from before *Archæopteryx* to the time of *Rahonavis*. Moreover, if sickle claws are a primitive avian feature, then their absence in *Protarchæopteryx* and *Caudipteryx* reinforces the conclusion that these creatures are birds rather than dinosaurs. Theropod advocates will not look favourably on that implication.

4. Similarities overstated

It is not widely known at the popular level, but many of the key characters seen as uniting birds and theropods are disputed. According to Feduccia, these include:

> the nature of the pelvis (Martin 1991; Tarsitano 1991), the homology of the digits (Hinchliffe and Hecht 1984; Hinchliffe 1985; Martin 1991; Tarsitano 1991), the nature of the teeth (Martin, Stewart, and Whetstone 1980); Martin 1991), the hallux (Tarsitano and Hecht, 1980; Martin 1991; Feduccia 1993a), the ascending process of the astragalus (Martin, Stewart, and Whetstone 1980; Martin 1991; also see McGowan 1984, 1985 and reply by Martin and Stewart 1985), the pubis (Martin 1983a, 1983b, 1991; Tarsitano 1991; also see Wellnhofer 1985), and even the supposed unique semilunate carpal thought to be shared by *Deinonychus* and *Archæopteryx* (and modern birds) (Martin 1991; Tarsitano 1991). (Feduccia, 1996, p.68.)[39]

Since the hypothesized relationship of theropods to birds is based on the similarity of certain features, uncertainty about that similarity casts doubt on the hypothesis. There is obviously more art in the interpretation of these fossils than popular presentations would lead one to believe.

5. Lung questions

John Ruben, an expert in respiratory physiology, concluded from an examination of *Sinosauropteryx* 'that theropods had the same kind of compartmentalization of lungs, liver, and intestines that you would find in a crocodile'—and not a bird (Gibbons, 1997b, p.1230). The thoracic cavity and the abdominal cavity of theropods appear to have been completely separated from each other by the diaphragm, whereas birds have no such separation. In living crocodilians, the function of this separation is to provide an airtight seal between the cavities. Air is drawn into the bellows-type lungs by contraction of the diaphragmatic muscles which creates negative pressure in the thoracic cavity.

One reason this is significant is that, as Ruben argues, 'a transition from a crocodilian to a bird lung would be impossible, because the transitional animal would have a life-threatening hernia or hole in its diaphragm.' According to Ruben, this means that if there is a relationship between dinosaurs and birds, 'it's not the linear relationship you see in the museum displays' (Gibbons, 1997b, p.1230).

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[37] He writes, 'The common ancestor of birds and dromæosaurs has yet to be found in the fossil record. However, we can speculate from cladistic analysis that this hypothetical bird ancestor would be very similar to dromæosaurs in general morphology.' He concludes, 'Dromæosaurs are currently the best approximation of the hypothetical bird ancestor and serve as a model when tracing avian ancestry.'

[38] She told the Associated Press, 'This animal gives powerful new evidence to support the theory that birds descended from dinosaurs,' and said it may be 'the strongest last nails in the coffin' for those who doubt that birds evolved from dinosaurs. (Anonymous, 1998). *Rahonavis* dates from 65–75 million years ago.

[39] The specifics are elaborated upon at Feduccia, 1996, pp. 68–81. For a response from theropod advocates, see Padian and Chiappe, 1997, pp.73–78. Suffice to say that neither side is persuaded. The debate about digital homology has received a fair amount of attention. Opponents of theropod origins argue on the basis of embryological developmental patterns that the three digits of the avian hand are II–III–IV, whereas it is agreed that the digits of the theropod hand are

These results were confirmed by the subsequent work of Ruben's team on the maniraptoran *Scipionyx samniticus* (Ruben *et al.*, 1999). This unique specimen, which has the best preserved fossil organs of any dinosaur ever found, revealed under ultraviolet light the arrangement of some of its internal organs. As Ruben stated in an interview, 'It seems clear that a bird's radically different system of breathing, in which air is continuously drawn through its lungs, could not have evolved from the hepatic-piston system we see in this theropod dinosaur' (Browne, 1999).

Regarding the conclusions of Ruben's team, Larry Martin has stated, 'There's actually no way they could be wrong about this. The *Scipionyx* specimen has the best preservation ever seen. It's one of the biggest discoveries of this decade. It tells us more about dinosaurs than any other specimen. The positions of the dinosaur's windpipe and colon serve as independent checks that the animal did not have a bird's breathing apparatus' (Browne, 1999).

In fact, it is impossible to imagine any animal whose lungs could have given rise to those in birds. 'No lung in any other vertebrate species is known which in any way approaches the avian system' (Denton, 1998, p.361).[40] Denton's amazement regarding the avian lung is apparent:

> Just how such a different respiratory system could have evolved gradually from the standard vertebrate design without some sort of direction is, again, very difficult to envisage, especially bearing in mind that the maintenance of respiratory function is absolutely vital to the life of the organism. Moreover, the unique function and form of the avian lung necessitates a number of additional unique adaptations during avian development. As H. R. Dunker, one of the world's authorities in this field, explains, because first, the avian lung is fixed rigidly to the body wall and cannot therefore expand in volume and, second, because the small diameter of the lung capillaries and the resulting high surface tension of any liquid within them, the avian lung cannot be inflated out of a collapsed state as happens in all other vertebrates after birth. In birds, aeration of the lung must occur gradually and starts three to four days before hatching with a filling of the main bronchi, air sacs, and parabronchi with air. Only after the main air ducts are already filled with air does the final development of the lung, and particularly the growth of the air capillary network, take place. The air capillaries are never collapsed as are the alveoli of other vertebrate species; rather, as they grow into the lung tissue, the parabronchi are from the beginning open tubes filled with either air or fluid (Denton, 1998, p.361).

In Denton's opinion, 'The avian lung brings us very close to answering Darwin's challenge: "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down".' (Denton, 1998, pp.361–362.)

6. Flight question

A corollary of the theropod theory of bird origins is that flight evolved from the ground up (cursorial theory) rather than from the trees down (arboreal theory). There is, however, no plausible explanation for how this could have occurred. The difficulty is so great that Chatterjee, who supports theropod ancestry, suggested recently that some theropods may have been tree climbers (Chatterjee, 1997, pp.161–184). If they were, they apparently left no evidence of that ability. According to Fastovsky and Weishampel:

> It has been argued that perhaps the earliest birds scaled trees, and from that position learned to fly. There is, however, no evidence for an arboreal proto-bird, no evidence for climbing adaptations, and no evidence in the skeleton of any non-avian theropod for arboreal habits (Fastovsky and Weishampel, 1996, p.313).

The cursorial theory of flight origin was first proposed by Samuel Williston in 1879. He simply raised the idea that flight could have evolved through a series of steps (running, leaping, jumping from heights, and finally soaring) without addressing any of the details of how that might have happened. The following year, O. C. Marsh proposed an arboreal theory of flight origin, and this theory has since held sway with the majority of evolutionists. The cursorial theory has, however, had several periods of revival (Feduccia, 1996, p.97; Chatterjee, 1997, p.151).

In 1907 and 1923, Franz Baron Nopsca elaborated on Williston's claim by suggesting that wings would develop to increase the speed of an animal as it ran along the ground. 'Nopsca's ideas on the origin of flight were severely criticized by other workers because the use of wings to increase running speed has no living analogs and because outstretched wings would increase drag (Heilmann 1926; Ostrom 1974; Bock 1986)' (Chatterjee, 1997, pp.151–152).[41] Feduccia labels the theory an 'aerodynamic absurdity' (Feduccia, 1996, p.98).

Roughly fifty years later, John Ostrom proposed a new version of the cursorial theory. He suggested that wings developed from arms used to catch insects. The 'feathers were first present as insulators and later became elongated

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I–II–III. If this is correct, the three digits are not a shared feature inherited from a common ancestor and thus argue against theropod ancestry. (See Burke and Feduccia, 1997; Padian and Chiappe, 1998b, pp.7–8).

[40] Padian and Chiappe state that bird lungs 'are extremely complex and are unlike the lungs of any living animal.' (Padian and Chiappe, 1998a, p.43). Pough *et al.*, say, 'The respiratory system of birds is unique among living vertebrates.' (Pough *et al.*, 1989, p.621).

[41] Burgers and Chiappe have recently argued that *Archæopteryx* could have gained the velocity necessary to take off from the ground by flapping its wings as it ran. (Burgers and Chiappe, 1999). The validity of their analysis remains to be seen, but in any event, it assumes the presence of *Archæopteryx*-type wings to generate the hypothesized forward thrust. It thus does not seem useful in explaining how such wings developed in the first place.

fly swatters' (Chatterjee, 1997, p.153. See also Feduccia, 1996, pp.98–101). This 'insect net' theory was heavily criticized on four major grounds, and in 1983 Ostrom rejected his own hypothesis (Chatterjee, 1997, p.153; Feduccia, 1996, pp.98–101).[42]

The latest attempt to explain a cursorial origin of flight is the 'fluttering model' of Caple, Balda, and Willis published in 1983.

In this theory, the avian feathered wing and concomitant flapping evolved in creatures with bipedal cursorial habit to control body orientation during leaping and in landing. Feathered wings and flapping, argue the authors, would increase the distance of the leap and therefore the running creature's ability to capture insect prey ... For them, the most appropriate selection pressure for the enhancement of wings is stability while running at high speed, perhaps to escape predation (Feduccia, 1996, p.102).[43]

Like its predecessors, this theory has faced a barrage of criticism.[44] For example, Jeremy Rayner has calculated that the hypothesized proavian would suffer a 30–40 percent drop in running speed as it leaped into the air, which creates a serious problem in terms of attaining any type of flight. He concludes:

> The first 'flights' of a fluttering proto-flapper would have been at low speeds, where the energetic demands of flight are at their most extreme (Clark, 1977), and the wingbeat cycle is at its most complex. The fluttering model fails because it takes no account of the extreme morphological, physiological and behavioural specializations required for flight. (Raynor, 1988, p.278).

Thus, Chatterjee is compelled to admit that 'the cursorial theory, even in its modified form, is biomechanically untenable' (Chatterjee, 1997, p.155). Fastovsky and Weishampel, who also favour the theropod theory, likewise acknowledge:

> Fundamentally, however, it has proven nearly insurmountable to 'design' a cursorial theropod that developed flight by running along the ground. Functional morphologists—that is, scientists who study the function of particular anatomical structures—have been unable to satisfactorily model the running-to-flight transition in early birds. (Fastovsky and Weishampel, 1996, p.313).

It is also significant, from an evolutionist perspective, that there are no contemporary examples of cursorial bipeds that use forelimbs for stability. As Walter Bock states:

> I know of no small tetrapods about the size of *Archæopteryx* that are primarily terrestrial (*e.g.*, not flying-running forms, or secondarily flightless or degenerate flying forms) and use their forelimbs for balance during fast running or during a leap. And I know of none using the forelimbs as flapping structures to provide forward thrust to increase the length of its leap (Bock, 1986, p.68).

In fact, kangaroos, which share several functional traits with theropods (obligate bipedality, cursorial posture, short forelimbs, long tail) and thus offer a modern analog for testing the theory, do not extend their forelimbs during jumping. Rather, the limbs play a passive role. 'To minimize drag force, they are kept in a folded position in a strictly sagittal plane during takeoff, midway through the leap, and during landing' (Chatterjee, 1997, p.155). The use of the forelimbs in these animals does not mimic a rudimentary flight stroke.

Conclusion

The idea that birds evolved from dinosaurs remains at best a highly speculative hypothesis. One suspects its popularity has less to do with the evidence for theropod ancestry than with the Darwinian aversion to ancestral vacuums. When palæontologist Hans-Dieter Sues says, 'Only dinosaurs are anatomically suited to be the precursors of birds', (Ackerman, 1998, p.96) he is saying that, when it comes to bird origins, it is dinosaurs or nothing. Since evolutionists are convinced that every taxon arose from some other, 'nothing' is not an option. This philosophical predisposition induces them to read lineages into ambiguous data. They compound that error by confusing these interpretive constructs with fact.

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[42] Though Ostrom had abandoned the theory by 1983, he apparently did not formally publish that opinion until 1986.

[43] Chatterjee describes the theory this way:

> According to these authors, the proavians might have used their jaws to catch prey but employed their wings as bilateral stabilizers during a jump into the air. Caple and colleagues maintained that the rudimentary wings of proavians were effective for balance while running, jumping, and turning, until they were able to take off at high speed. They speculated that, when the proavians extended their forelimbs, minute increments of lift made it easier to jump further and capture more prey. The motion of the forelimbs for stabilization, according to them, would mimic the flight stroke of a bird. Eventually, the proavians evolved larger airfoils that enabled them to obtain even greater lift. Also, as lift increased it aided in landings. Therefore, the proavians could slow down and direct their landings. As a result, power flight evolved. (Chatterjee, 1997, pp.153–154).

This theory has recently been modified by assuming that the hypothesized cursorial ancestors of birds specialized in pouncing on their prey from elevated sites. (Garner *et al.*, 1999; Taylor, 1999). So instead of leaping on prey from trees, which they could not climb, they supposedly leaped on prey from other structures that they could climb. Of course, one can only speculate about the terrain in which these alleged avian ancestors hunted, but even if there were a sufficient number of elevated sites that were frequented by prey, the tail and sickle claws of dromæosaurids seem ill suited for climbing of any kind. It also seems unlikely that a predator apparently built for running would catch its prey by waiting for it on a perch. And certainly an enhanced pouncing ability cannot account for the presence of alleged 'protofeathers' (the filamentous structures) on the seven-foot-long *Beipiaosaurus*. If one accepts *Caudipteryx* as a nonavian theropod, as do Garner *et al.*, the fact it was an herbivore rather than a leaping predator presents an additional problem. Taylor's attempt to counter this with the assertion that *Caudipteryx* was an insectivore (Taylor, 1999, p.32) is hindered by the fact the only other theropod found with gastroliths was almost certainly an herbivore. (Kobayashi *et al.*, 1999).

[44] Included in this list of critics are Jerison, Rayner, Bock, Martin, Feduccia, Norberg, and Pennycuick. (Chatterjee, 1997, p.155).

One can state the matter no more forcefully than did Storrs Olson in his November 1, 1999 letter to the most prominent scientist at the National Geographic Society. He concluded with the following:

> The idea of feathered dinosaurs and the theropod origin of birds is being actively promulgated by a cadre of zealous scientists in concert with certain editors at *Nature* and *National Geographic* who themselves have become outspoken and highly biased proselytisers of the faith. Truth and careful scientific weighing of evidence have been among the first casualties of their program, which is now fast becoming one of the grander scientific hoaxes of our age—the palæontological equivalent of cold fusion. If Sloan's article is not the crescendo of this fantasia, it is difficult to imagine to what heights it can next be taken. But it is certain that when the folly has run its course and has been fully exposed, *National Geographic* will unfortunately play a prominent but unenviable role in the book that summarizes the whole sorry episode.

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The Author

We welcome Ashby L. Camp to our pages with this thorough treatment of the supposed evolution of birds. Ashby graduated with high honours from the University of Florida in 1974. He earned a Juris Doctor degree from Duke University School of Law in 1977 and worked as a trial attorney for ten years. In 1990 he earned a Master of Divinity degree from Harding University Graduate School of Religion. Mr. Camp currently ministers at University Church of Christ in Tempe, Arizona. He has studied the issue of origins for years.

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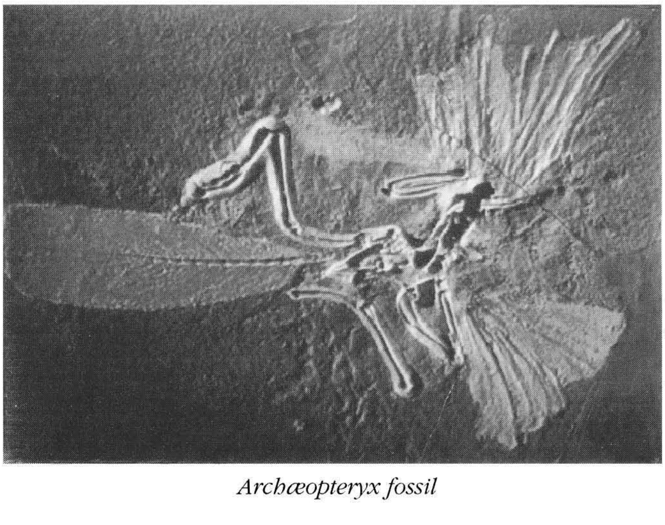

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Archæopteryx fossil

The Origin of Species – Creation Style!

Paul Garner

ANTI-CREATIONISTS often think that if they can demonstrate that new species can arise today they have proved particles-to-people evolution. 'Genesis teaches the fixity of species,' they say, 'but look! Here is a case in which a new species has been seen to originate in modern times'. The reaction of informed creationists to such evidence is usually a great surprise to them. Not only do we affirm that new species can and have arisen, but in fact the recent-creation view of earth history depends upon it! This may seem puzzling, even shocking, to some readers so allow me to explain further.

First, let us take a brief look at what the Bible says. Genesis does not propose the fixity of species; it teaches that the animals and plants reproduce 'after their kind'. There are no biblical reasons to equate the phrase 'kind' (Hebrew: *min*) with the modern concept of 'species'. I would go further and say that there are strong biblical and scientific reasons to distinguish the two concepts. The evidence in support of speciation (the development of new species) *within* the created kinds is very powerful and the Bible does not preclude it. Informed creationists—especially the biologists—readily acknowledge this. To document this fact, allow me to quote a few of them:

John Woodmorappe
'Anti-creationists commonly raise doubts if new species and genera could arise in only the few thousand years since the Flood. In doing so, they only display their ignorance of both creationist and evolutionist research along these lines. In fact, the release of single pairs and seven pairs of animals [from the Ark] must have facilitated the rapid origin of new species and genera' (Woodmorappe, 1996, p.7, see also pp.180–182).

Dr. Lane Lester, Creation Research Society
'The processes of recombination and natural selection in new environments in many instances caused the members of the same baramin [created kind] to divide into separate races and species' (Lester, 1996).

Dr. Carl Wieland, Answers in Genesis
'It is clear from such examples [he gives an example in gulls] that species are not fixed and unchanging, and that two apparently different species may in fact be genetically related The formation of new species actually fits the creation model very comfortably' (Wieland, 1994, pp.10,11).

'Poorly-informed anti-creationist scoffers occasionally think they will 'floor' creation apologists with examples of 'new species forming' in nature. They are often surprised at the reaction they get from the better-informed creationists, namely that the creation model depends heavily on speciation' (Wieland, 1997, p.135).

Dr. Don Batten, Answers in Genesis
'New 'species' can and have formed, if by definition we mean something which cannot breed with other species of the same genus, but this is not evidence for evolution' (Batten, 1996, p.22).

Dr. Leonard Brand, Geoscience Research Institute
'Genesis does not seem to have anything to say against microevolution and, perhaps, even some macroevolution, at least to the development of new genera' (Brand, 1997, p.125).

I have reproduced these quotations to demonstrate that speciation is not disputed within the ranks of creationist biologists. In fact, it would probably be difficult to find a PhD creationist biologist who does not believe that one species can change into another.

Furthermore, there are numerous documented examples in the published literature where new invertebrate or vertebrate subspecies, species, and genera have originated in modern times. The same is true for plants. In fact, several of these speciation events occurred in remarkably short time spans (years or decades). Many examples have been collected by both creationists (Brand and Gibson, 1993, p.72; Jones, 1982; Lester and Bohlin, 1989, pp.123–125; Woodmorappe, 1996, pp.180–182) and evolutionists (Boxhorn, 1995; Briggs, 1974, pp.442–443). Here is a selection (though check out the references above for many more):

- Green monkeys (Ashton, Flinn, and Griffiths, 1979)
- Myna birds (Baker, 1987)
- Mice (Berry, 1992)
- Snails (Dodson and Dodson, 1976)
- Copepods (Johnson, 1953)
- House sparrows (Johnston and Selander, 1964)
- Cichlid fish (Kornfield, 1978; Owen *et al.*, 1990)
- Tropical birds (Moreau, 1966)
- Beetles (Nagel, 1986)
- Moths (Zimmerman, 1960)

At this point, you may be asking yourself, 'How exactly does one species change into another?' A creationist book that is helpful in this respect is Brand (1997), especially his sections 'Microevolution and speciation' (chapter 8) and

'An interventionist theory of natural selection and biological change within limits' (chapter 12). Also, any major textbook covering evolutionary mechanisms would be useful background reading (*e.g.* Dowdeswell, 1984). There are two main mechanisms by which new species may be formed. The more usual situation is when isolation due to a physical or geographical barrier of some kind prevents further breeding (allopatric speciation). A rarer possibility involves no ecological barrier, only the localised action of strong selective forces on particular variants, resulting in a discontinuous pattern of distribution (sympatric speciation). Brand points out that post-flood conditions would be especially favourable for rapid speciation because:

- there would be an abundance of potential unoccupied niches to which organisms could adapt; and
- rapid geological and environmental changes would favour the separation of organisms into isolated populations, facilitating speciation.

However, I conclude with one crucial point, and it is a point that is fatal to the anti-creationist case. The type of biological change we see occurring today (which often leads to the development of new species) results from a loss of genetic information or the recombination or selective expression of genetic information already present within the created kinds. It does not occur by the addition of functional genetic information and does not result in one biblical kind changing into another. That is why Richard Dawkins was stumped when asked in an interview (*From a frog to a prince*, 1998; Truman, 1999) to give an example of a mutation that added functional genetic information, and why new species originating today provide no evidence at all for particles-to-people evolution.

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Reader's Viewpoint

Sergey N. Rumyantsev

A New Geophysics of the Creation of Continents and of Noah's Flood

A NEW scientific model is suggested to support the concept of the Creation of the earth's crustal geology structure and Noah's flood. According to this mechanism the surface of primordial earth was completely covered by waters. The single supercontinent Pangæa surrounded by Panocean, as proposed by many geologists, never existed on the earth. The oceans, seas and continents were made at the third day of Creation by the expansion of the plastic parts of the earth (core and mantle) and resultant fracturing of the firm crust.

As expansion continued, the previously intact earth's crust parted forming large fissures. The continents so formed did not move laterally, but remained fixed at the same location on the mantle. The worldwide Flood of Noah's day occurred when the will of God shrank the earth's core/mantle. This caused the earth's crust to fall, and the ocean basin to contract, extruding waters from the oceans on to the surface of the land. The world-wide Flood ended because the earth's core/mantle was expanded by God, and the pieces of the earth's crust united during the previous core/mantle contraction were broken again, forming the large ocean basin that received the receding flood waters.

Introduction

The present structure of the earth consists of:

1. a hot molten core, consisting mainly of iron and nickel,
2. a hot plastic mantle,
3. a firm crust, covering the earth's surface,
4. surface waters, and
5. atmosphere (Clark, 1971).

It is assumed that Earth has always had this same basic structure throughout its history since the Creation. The modern picture of earth is that it is made of fragments of broken continental crust separated by oceans.

The subject of the origin and the early history of the earth have always been a controversial issue. How did the continents and oceans originate? Perhaps the most popular interpretation is that given in the hypotheses of a single primordial supercontinent (Pangæa) and subsequent global plate tectonics or continental drift. But these hypotheses do not give an entirely satisfactory answer. There are radical differences among proponents of the various hypotheses, because they can not explain, for instance, the distribution of sediments (Reed *et al.*, 1996; Meyerhoff and Meyerhoff, 1972).

The purpose of this article is to examine, in the light of Holy Scripture, the creation of the earth's continents and oceans as well as the world-wide Flood. Our article is designed to challenge the evolutionary hypothesis with a biblical view of the world as well as to challenge the view of some Bible believers regarding their alternative interpretations of Genesis 1:1–2. In order better to understand the biblical account of the Creation and the Flood, I would like to look at each of the relevant statements of Holy Scripture, showing how each can be supported by logical and observable evidence. Firstly I would draw the reader's attention to the great incompatibility of the Pangæa supercontinent hypothesis with the account we are given in the Holy Scripture (Genesis 1:1–2). Secondly, I would like to propose how the relevant statements of Holy Scripture might be better interpreted today. And thirdly, I put forward a new model for the creation of continents and Noah's Flood.

The floating continents?

A central question in understanding the Earth's structure is, exactly how did the present distribution of continents and oceans originate? The present earth's surface consists of seven sections of continental crust separated by oceanic crust. The continental platforms are made of granite and located high above the ocean basins. It is generally accepted by geologists that the earth's continental land mass was originally one piece (Figure 1, B, I), but broke apart and separated into the several continents that are observed today. One could notice that the eastern and western shores of Atlantic fit together like pieces of a

[*Editorial comment:* We offer this article by Prof. Rumyanstev, but recognise that it is speculative in its content. The 'expanding earth concept' is certainly worth considering, but it requires much more research.]

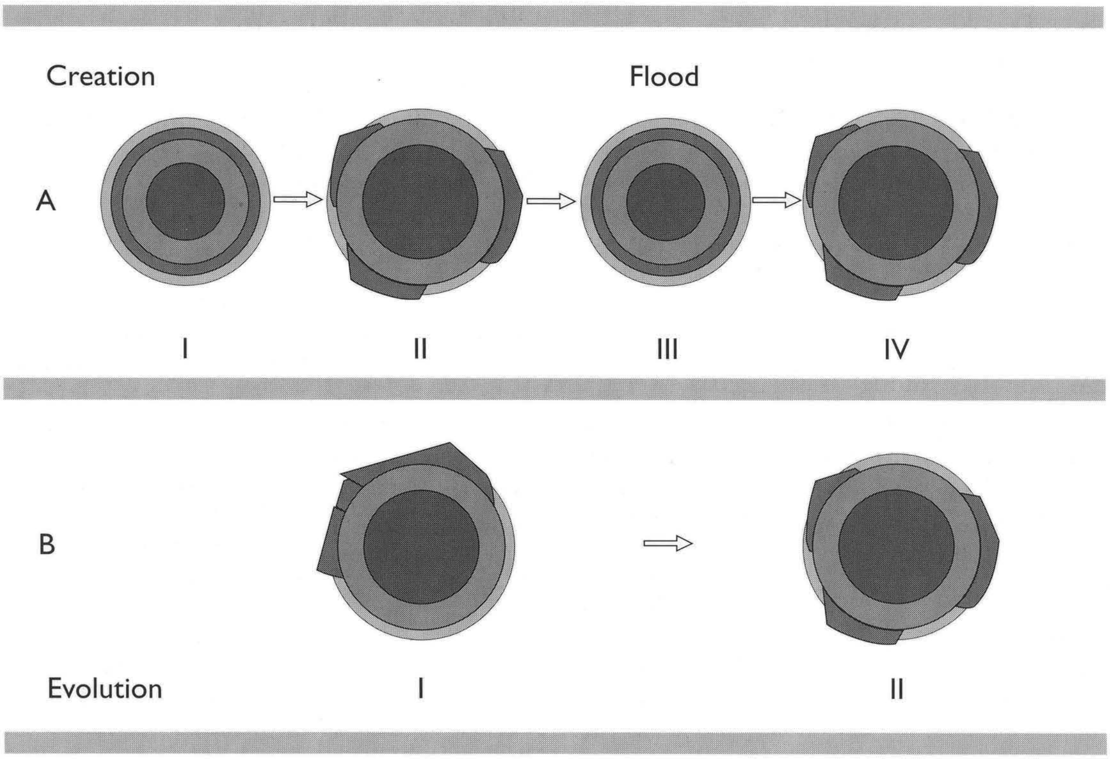

Figure 1: Geotectonics of Creation and Worldwide Flood (A) in comparison with evolutionary hypotheses (B)

puzzle. This view is not contrary to the account we are given in the Holy Scripture.

What events took place to bring about the division of the one land mass as well as separation of oceans by continents? The most popular mechanism proposed by evolutionists for division of the primordial supercontinent is the hypothesis of global plate tectonics or continental drift. According to this hypothesis, some process or event caused the Pangæa supercontinent to split and gradually separate—perhaps triggered by collision of the Earth with a major cosmic object. The subcontinents floated on the hot molten mantle and over millions of years moved into the positions we observe today (Figure 1, B, II). This hypothesis however is at odds with the account given in the Holy Scripture as well as with basic scientific data. Moreover there is much evidence against the idea of continental drift.

The first day of Creation

Creationists as well as evolutionists agree that the primordial structure was a single coherent mass. The first part of the evolutionary hypothesis does not contradict the correctness of this statement. However its second part—the concept of a primordial supercontinent (Pangæa) surrounded by a primordial Panocean (Figure 1, B, I) and the concept that this supercontinent had floated on the hot mantle beneath—meets objections from geophysics (Meyerhoff and Meyerhoff, 1972).

Genesis 1:1–2 states 'In the beginning ... the earth was without form, and void; and ... the Spirit of God was hovering over the face of the waters'. That infers that the surface of the initial earth was totally covered by water, and the continental land mass was under the waters (Figure 1, A, I). Pangæa did not exist in the first day of the earth Creation. This is the first statement of our hypothesis based on Bible verses.

The second day of Creation

During the second day of Creation, God made the firmament, which he called heaven, and divided the waters which were under the firmament from the waters which were above the firmament (Genesis 1:6–8). Here God elevated a part of the waters from the primordial ocean and put it into space over the firmament. Thus, according to Holy Scripture, Pangæa did not exist on the second day of Creation. This is the second statement of our hypothesis based on Bible verses.

The third day of Creation

Then God said (in the third day of Creation): 'Let the waters under the heavens be gathered together into one place, and let the dry land appear'. 'And God called the dry land Earth, and the gathering together of the waters He called Seas.' (Genesis 1:9–10). Thus the withdrawal of water exposed dry land at the beginning of the third day of Creation. Moreover God made not one Sea (Ocean) but many Seas. That infers that the freshly formed Seas surrounded something previously covered by water—*i.e.*

the continents and seas were created simultaneously at the beginning of the third day of Creation.

Earth expansion as the driving mechanism for continent Creation

How can the water level become low, on a lower level exposing dry land? It seems reasonable to propose that ocean basins were created to receive the water at the time of the appearance of dry land.

According to current understanding, when the large scale crustal fractures opened and spread laterally, basins of modern oceans were formed. To create oceans and continents on the third day, it is proposed that previously united continental crust were fractured, elevated and separated to the positions which are observed today.

It is proposed that earth expansion, possibly due to temperature induced dilation of the core/mantle, is the driving mechanism. The hot core and mantle's expansion should induce the cold brittle continental crust to fracture and become separate subcontinents (Figure 1, A, II). Simultaneously the waters fill the low areas formed between the separating continental blocks. The level of the water thereby becomes low and the dry land appears.

Thus it is proposed that fracturing and horizontal divergence of the organic whole primordial continental earth's crust first occurred on the third day of Creation. The continents did not move laterally but remained in the same positions.

The proposed mechanism for the creation of oceans and continents is quite simple. It is so simple an explanation and it explains so much. The model of an expanding primordial earth can explain several features on contemporary earth (Morton, 1983).

This hypothesis is also supported by the data of some geophysicists. The suggestion that the earth's radius has expanded is not new. According to Heezen (1960) the earth is expanding and the continents did not move laterally but remained the same size. Expansion of the earth would change only the relative positions of the continents. That is why the entire surface of a smaller primordial earth could be covered with an unbroken shell of granitic material. Expansion from within would then have broken this shell into separate continental rafts (Heezen, 1960). According to Dirac's theory (Dirac, 1937), developed by Jordan (1971), the Earth should have gone through a noticeable expansion in the course of time. Jordan supposed that in this idea we have, for the first time, an explanation of the peculiar subdivision of the Earth's surface into continental shelves and deep-sea basins. Unfortunately, the hypothesis of an expanding earth has never achieved widespread acceptance among geologists because of the lack of a mechanism to explain the expansion.

The essential element of the proposed model is that it does not require any lateral displacements of individual continental blocks by the thousands of kilometres postulated by the modern plate tectonic hypothesis.

The world-wide Flood

Evolutionists believe that there has not been a major global cataclysmic flood. It is argued, for instance, that the earth's water supply was not sufficient for a world-wide flood. How could there have been enough water to possibly cover the entire earth in its present form? Where did the water come from, and where could it have gone after the Flood?

We know there was plenty of water to create a world-wide flood. If the earth were a smooth sphere, with its land areas flattened out, the earth's waters would cover it all to a depth of more than 2,800 metres (9,250 feet).

The biblical account of Noah's Flood indicates that waters prevailed on the earth during the hundred and fifty days after the forty days and forty nights of rain. How could this work? Where did the floodwaters go after the flood was restrained? The correct answer is crucial to understanding the Genesis Flood itself and for interpreting the geological record in a coherent and valid manner.

Many diverse mechanisms have been put forward to explain the Flood (Baumgardner, 1994). Modern creation scientists offer the following natural causes of the Noah's Flood:

1. a rapid shifting of the Poles;
2. the collapse of a water canopy that surrounded the earth before the flood;
3. vulcanism and earthquakes;
4. the shifting of the earth's crust; and
5. an extra-terrestrial body passing close by the earth, differential earth expansion, violent rupture of the crust by pressurized subterranean water, subduction of the pre-Flood ocean lithosphere (Austin *et al.*, 1994).

There are serious difficulties with each of these ideas.

A new Geophysics of Noah's Flood

The new geophysics of Noah's Flood proposes two stages:

a. Progressive stage: the shrinking earth

It is proposed that the world-wide Flood of the Noah's day occurred when the earth's expansion proposed for the 3rd day of Creation reversed, causing the continental crust to collapse toward the centre of the earth. The surface area of the globe would diminish and waters were extruded from the oceans onto the surface, depositing sediments there.

b. Regressive stage: the expanding earth

During the terminal stage of the Flood, God could have simply dilated the earth's core/mantle again as described for the third day of Creation causing the continental crust to become separated into pieces once again and to re-emerge from the covering waters. The oceans assume the previous or newly created basins (Figure 1, A, IV) that we observe today.

Conclusion

Within the past 10–15 years, there has been renewed interest in studying modern science from a biblical basis. In the face of accumulating scientific data, scientists have become convinced that the biblical record of the divine creation of the world is reliable. Much has been learned about the nature, history and contemporary structure of the earth from the Scriptures. It is my opinion that the above-proposed shrinking–expanding mechanism is consistent with the scriptural earth history and explains many geological features of our contemporary planet. It appears capable of explaining a wide variety of both biblical and geological data including the origin of rocks and disposition of fossils and sediments, which are incapable of being explained by evolutionary hypotheses. Scientists must train their minds to rethink the overwhelming evidence from geology, biology, physics and astronomy which contradicts their rejection of the Bible.

Acknowledgment

I am deeply grateful to Paul Garner and Dr. David Tyler for their guidance in preparation of my manuscript. Quite honestly this publication could not have been produced without this extraordinary help.

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The Author

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Acknowlegements

We have had a few queries raised recently about sources of material, especially artwork, used in *Origins*. Our policy is to rely on authors to provide material which our graphic artist can modify as appropriate. It may be supplemented from our own resources. This is usually original material but may involve the use of previously published material. In the latter case, we expect the authors to obtain appropriate permission to use it or modify it. *Origins* does not have access to any files of artwork except what individuals have collected in their own research. Unfortunately this means that sometimes the details of the sources are mislaid. On other occasions we have been slack in tracing and acknowledging sources.

The editorial team are seeking to tighten up procedures to deal with these matters in the future. We have apologised to our good friends, *Answers in Genesis*, because we did not obtain their permission or acknowledge that two of the figures of the eye in *Origins 26* were derived from figures in their journals, *Creation Ex Nihilo Technical Journal* and *Creation* magazine. We apologise to them and, indeed, any others who feel their copyright has been infringed.

Amendments

There is a need for some amendments to *Origins 27*.

On page 3, in the article on design, there is an error in the text alongside the figure of the feather. This should read as follows:

> 'The hooks link the barbules together to give a closed surface for the downward movement of the wing. The feathers then twist due to the action of tiny muscles to open the surface for the upward movement. The hook system is similar to that on a zip fastener. In the wing there are estimated to be a million hooks per feather and, by preening, the bird has to fasten these.'

Our apologies for this mis-statement, which confuses the twisting of the feather with the barbule.

On page 16, in the article on ape-men, please amend the first figure so that the word 'hominids' refers only to the line leading to humans.

In the notes about the authors on page 24, we overlooked Nancy Darrall's doctorate, so please note that she holds a PhD for her work in botany.

Review Article

Sheena Tyler

The Manipulated Embryo

HOW was Parliament manipulated to change its mind from banning human embryo research to instead legislate in its favour in 1990? Michael Mulkay, professor of sociology at the University of York, gives us the reasons, and his excellent and impartial analysis of the debate should be essential reading for anyone with interest or concern over the ongoing issues of the reproductive technologies. The lessons that can be learned from the failure of the pro-lifers to win the debate are highly relevant to the legislative issues of today and beyond.

It is astonishing that in 1985 the House of Commons voted 4:1 against embryo research, but by 1990 it voted 2:1 in favour of research. Mulkay describes the opening climate of debate, in which the majority of speakers 'rose to express their passionate indignation ... and pressed for the immediate cessation of these immoral activities.' They rejected the Warnock Report, which had recommended the viability of embryo research up to 14 days. It is worth noting in passing that Mary Warnock had conceded that 'she and her committee did not trust the scientists alone to regulate themselves ... reputable journals were giving reports of likely advances ... which were a justifiable cause for concern.' Mulkay concludes that

> the morality issues arising from these research developments could not be decided by experts who were interested parties.

The embryo research debate : Science and the politics of human reproduction by Michael Mulkay is published by Cambridge University Press, 1997. ISBN 0 521 57683 0

However, the overwhelming vote against research brought shock and dismay to the scientific community. Mulkay describes 'a mood approaching panic in the editorial office of *Nature*,' which supported the Medical Research Council (MRC) proposals to set up a Voluntary Licensing Authority (VLA) to supervise embryo research. *Nature* forwarded the argument (p.27) that research on embryos would reduce the incidence of spontaneous abortions and abortions induced for genetic reasons. We can distil out the reasons for the turning of the tide of opinion.

Reason 1

The scientific press, particularly *Nature* and *New Scientist*, urged pro-researchers to not give up hope, but to

> increase their media participation and proclaim the social benefits of the research (p.35).

Reason 2

A pro-research group called Progress was formed. This grew out of a 'crisis team of MPs, doctors and individuals' (including some from the Christian Socialist Movement) which initially intended to prevent the passage of the Powell Bill that in turn sought to outlaw embryo research. Progress campaigned in Parliament and the media, working with the VLA, the MRC and the Royal Society. Campaigning details documented by Mulkay include:

> Members of the House of Commons and Lords were invited to visit IVF clinics and research centres; Members were visited by families with congenital abnormalities; pro-research documents were disseminated, with the Royal Society taking the 'unprecedented step of providing a 'fact sheet' about embryo research' and of sending pro-research representatives to Westminster to engage with Members; deputations to Government Ministers were organised; and scientists and doctors regularly went to Westminster to lobby parliamentary decision-makers (p.73).

As a result, by 1988 opinion was beginning to change, as more MPs in the 1988 White Paper debate began to use ideas and even terminology used by Progress. There was sustained lobbying of the 75 undecided MPs. Mulkay stresses that it was the manipulative power of 'a very small number of scientists' who presented a very well-organised, sustained and relentless campaign that was 'over-simplified and one-sided' because the pro-researchers were fighting for survival. An example of the one-sidedness was the utopia of the future assured by research, with negligible concern for the uncertainties, *e.g.* the dangers and failures of IVF treatment. A key player of this band of scientists was Lord Winston. Head of an IVF clinic and the most publicly visible member of Progress, Winston announced to the Press his IVF success using genetically screened embryos. Winston was shown with the happily pregnant mothers on the front of the daily tabloids just 5 days before the 1990 final Commons vote. At this stage, Mulkay notes a marked editorial shift in which the anti-research case disappeared under the pressure of the material 'strategically released by the members of the pro-research lobby.' He illustrates how the media succumbs by quoting an *Evening Standard* editorial, which reaffirmed the humanity of the newly conceived child, and linking the immoral depravity of embryo research with that of the Nazi experimenter Dr. Mengele. Yet just 5 weeks later the same newspaper showed a reluctant acceptance of embryo research benefits and its legitimacy.

Reason 3

Mysteriously, the Government did not legislate following the 4:1 vote against research in 1985. Why was this so? Mulkay suggests that this was *because the Government Ministers were themselves pro-research*, and they delayed legislation (until 1990!) to await a consensus (which, if one considers the change in ratio of anti-research:pro-research from 4:1 to 1:2, it never achieved). Mulkay concludes that the evidence from the parliamentary record suggests even in situations when Ministers were expected to be neutral, they spoke in ways that strengthened the pro-research position. The villains here include Lord Glenarthur, Lord Mackay, and most notably the Secretary of State for Health, Kenneth Clarke, who in summing up the final 1990 debate devoted more than two thirds of his speech to reasons favouring research , and apologised for the imbalance by claiming that those opposed to research could put their case more eloquently than himself. Mulkay castigates him, saying it is the role of the 'neutral Government representative to introduce the debate in a balanced manner with equal care given to the two opposing sets of considerations, rather than to leave those with whom the Minister happens to disagree to fend largely for themselves'.

Meanwhile, the Labour Party played a large part in sabotaging Powell's Unborn Children (Protection) Bill in 1985, and publicly denounced its own 44 Labour MPs who had taken an anti-research stance at this stage. Added to this, the Government made a tactical pro-research manœuvre in switching the first 1990 debate to the Lords: if approved there, research could only be halted in the Commons by the passing of an amendment. Mulkay analyses Conservative ideology. The Government Ministers came from the progressive conservative school, a minority view seeking to adapt Conservatism to the modern world, and embryo research was seen to provide benefits without social disruption. In contrast, the majority of Conservative MPs represented the mainstream traditional school that sought the maintenance of established values, with only small-scale, manageable change. Such Conservatives saw embryo research as a radical departure from established practice, violating the humanity of IVF embryos, and placing society on a morally downward slippery slope.

1990
EMBRYOLOGISTS
GET THEM TO THINK THAT THE EMBRYO IS JUST A BALL OF CELLS!
JUNIOR

Mulkay tells us that in the initial debates the great majority of speakers condemned embryo research because it represented the experimental use of living human organisms , which was 'contrary to Christian principle'. He states that the most commonly cited relevant speech was that of the Marquess of Reading: 'The whole of British law has been traditionally influenced by the Christian religion. That faith upholds the sanctity of every single human life ... which may be perceived by reason alone. It is the cornerstone of the natural law, without which all morality would be a matter of opinion. ... Clearly the Old Testament ... ascribes personhood to the developing embryo ... The embryo is referred to in personal terms rather than as a bundle of protoplasm ... human life, created in the image and likeness of God, has intrinsic value irrespective of its maturity or the development of functional skills. Thus embryonic human beings are the same person they will be when they are older and more developed ... To create, in the laboratory, isolated human beings for the purpose of experimentation, or to use so-called 'spare' embryos for that purpose, represents a blatant disregard for the civil rights of those human beings, as well as endorsing the principle that we can be justified in defining some human persons as non-persons in order to use them for our own interests'. From this quote we can see that the Christian basis for morality was central. It is of particular concern to Christians, therefore, to see how the pro-research lobby assaulted this position. This is evident in the next 3 reasons.

Reason 4

Because the humanity of the embryo was of prime concern, pro-researchers sought to undermine it by introducing the convenience term pre-embryo. With relentless lobbying, pro-researchers persuaded parliamentarians that research was confined to cells that represented merely unformed biological material, rather than a real person. Witness the change of opinion, for example, of Lady Saltoun. In 1984 she was anti-research, bestowing embryos with full moral status. By 1988, however, swayed by pre-embryo arguments, she no longer regarded the embryo up to 14 days as having human status. By cunningly sweeping away the humanity of the embryo, suddenly it appeared as if there was no moral issue at all.

Reason 5

The rhetoric employed by pro-researchers sought to undermine their opponents, by depicting it as a 'battle between scientific rationality and religious dogma'. Galileo was drawn into the debate in the role of scientific martyr, to warn of how non-scientific beliefs can thwart scientific progress. Mulkay does not comment further on the Galileo affair, but historians of science have long since dismissed this analysis. Opposition to Galileo was initially primarily from the scientists, who did not like him, and so they forced the hand of the religious leaders to claim that Galileo did not have a scientific case.

Mary Warnock relegated the religious opposition to faith, as opposed to the reason of science. Mulkay notes here Warnock's own tendentious position: her own Report states that life/personhood can only be decided by a 'complex amalgam of factual and moral judgements'. Mulkay concludes that Parliament became entirely dependent upon the 'experts' engaged in embryo research for their 'facts' concerning the human embryo. *Thus the authority of science was seen to be superior to that of other sources.*[1] One sees too the brazenness of pro-research rhetoric *e.g.* from Lord MacGregor in 1989. By this stage the tiny minority pro-research lobby were succeeding in making their views mainstream, to the extent that MacGregor could warn us that those opposed to research were now in the minority, and democratic legislators should never allow the minority to coerce the majority! Which side was threatening democracy?, one might ask!

It is not enough to defend the Christian ethic by reason alone, as did the Marquess of Reading. History has shown that both reason and conscience can be marred to call black white and wrong right. Ethics is not a matter of reason but springs from philosophical presuppositions or paradigms. If these are atheistic or Darwinian, ethics is informed by survival of the fittest and the continuity of life.

Other rhetoric employed by pro-researchers included the mythical figure of Frankenstein. Mulkay considers that it was the pro-researchers who primarily used Frankenstein to remove their opponents arguments to the realm of fantasy, in order to weaken their position. Mulkay balances this with the observation that pro-researchers also made wild, futuristic claims. He notes too the 'obvious link between the modern fertility clinic and the human production systems of Huxley's *Brave New World*'.

Reason 6

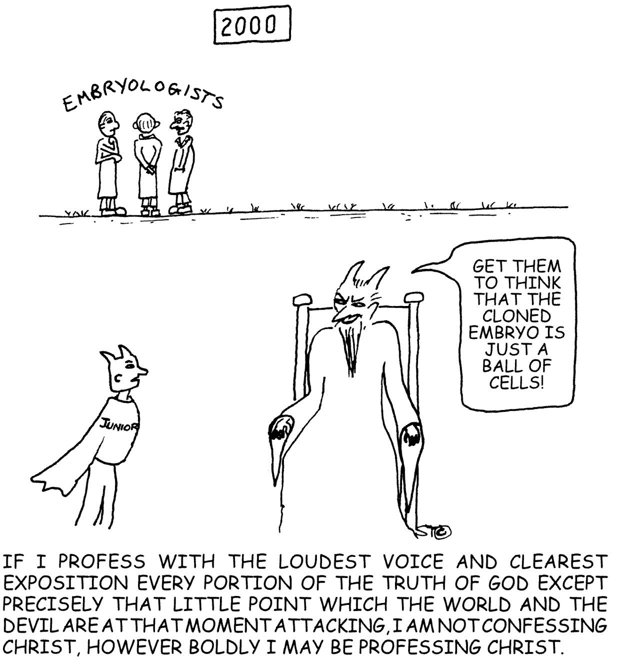
Mulkay describes religious disunity among the anti-research lobby. Whilst acknowledging the clear-cut pro-life stance of organisations such as LIFE and SPUC, he depicts the reluctance of the Anglican Bishops to enter the debate, and the few who did tended to emphasise the lack of a uniform Anglican view, except for Habgood, who expoused his personal pro-research opinions. I would add that Habgood had a profound influence on the debate, by creating confusion in Christian ranks. Mulkay surmises that 'in the absence of clear religious guidance, parliamentarians turned increasingly to the scientific community' (p.111).

Reason 7

According to Mulkay, the anti-research lobby were inadequate in publicising IVF failures, with its many examples of women suffering under the techniques of assisted reproduction (p132). Nor did they seem to use the personal testimony of such women in Parliament, as did their opponents with the human interest stories of IVF successes. Thus the powerful rhetoric of, for instance, Baroness Elles was not sufficiently exploited: 'a woman said to me only yesterday that, IVF treatment having failed, she was left in a terrible situation. She was just one of the many 92 % who were given hormones and drug treatment with effects which are still not known ... These women feel ... that they are being exploited by the scientists for the use of their eggs for embryo research and for the use of drugs on their bodies in order to produce superovulation ... if your Lordships as men, had to undergo [this] treatment ... the vast majority would go into the Lobby voting against research' (p.93). Mulkay also considers it a tactical mistake for anti-research advocates to make the link with abortion, which seemed to confuse or alienate some MPs.

Mulkay then charts post-legislation activity of the HFEA. In 1993 it rejected sex selection for social reasons. Then it banned the use of aborted and cadaveric eggs for IVF but permits their use for research, which Mulkay suggests that the HFEA is applying a 'crude ethical formula'.

He here discusses further the concept of the pre-embryo. Whilst this term is not used in the Human Fertilisation and Embryology Act, its application is implicit (p.135). He considers that this has created a moral ambiguity: anti-researchers deem the Act flawed in permitting 'grossly improper treatment of beings who are defined as human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EMBRYOLOGISTS
JUNIOR
GET THEM TO THINK THAT THE CLONED EMBRYO IS JUST A BALL OF CELLS!

IF I PROFESS WITH THE LOUDEST VOICE AND CLEAREST EXPOSITION EVERY PORTION OF THE TRUTH OF GOD EXCEPT PRECISELY THAT LITTLE POINT WHICH THE WORLD AND THE DEVIL ARE AT THAT MOMENT ATTACKING, I AM NOT CONFESSING CHRIST, HOWEVER BOLDLY I MAY BE PROFESSING CHRIST.
— *MARTIN LUTHER*

individuals within the Act's own frame of reference'. He cites Peter Garrett (p.136): at the moment [14 days] that the embryo receives its humanity it must be executed. Thus, what is now classed as a human being is treated as a pre-embryo.

The chilling prospect from all this is that virtually all of the above arguments are either being or are likely to be used all over again in the forthcoming debate on cloning. As with the pre-embryo, parliamentarians and public alike are being mislead over the humanity of the embryos from which stem cells are derived; the moral unacceptability of cloning is sidelined by its advocates' speculations of medical benefit, without assent to other possible routes to similar ends; full pregnancy cloning is extolled as the latest answer to infertile couples; even some of the key players are the same, notably Lord Winston. Thus clones are paraded as being mere twins, rather than as photocopies of the parent, with no reference to any psychological and biological implications for the cloned child. Habgood's mantle has been taken on by the Bishop of Oxford, Richard Harries. Just as at the start of the embryo research debate, parliamentary opinion towards cloning has shown a negative tone. Note, for example, Meacher (now Secretary of State for the Environment) warning that unless scientists are 'reined in by immediate legislation, science fiction nightmares such as ... cloning by nuclear transplantation ... might see the light of day'(p.126). But meanwhile, cloning research, particularly using embryonic stem cell technology, has gathered momentum in scientific journals, stealing ahead of the moral brakes.

One can deduce from Mulkay's charting of the debate's progress that biblical revelation appears irrelevant. No one is looking to the Bible for guidance or identifying principles. But in the absence of biblical anchors, there is no basis emerging for ethics. The scientists have not identified a coherent foundational code of ethics. Bioethicists appear to be marginalised, having little authority to influence the debate.

The biggest lesson of all emerging from this book is that the pro-research scientific community, by persistently and determinedly targeting parliamentarians and the media with pro-research propaganda, short-circuited the inputs of anti-research influence (*e.g.* letters to MPs, petitions, anti-research representation in debate). This pandered to the already widely established myth in our society of the supreme authority of the scientist. As we arrive on the brink of the cloning debate, such scientists are again at work, imposing this tyranny of the experts on our so-called democracy, in spite of overwhelming public opinion against cloning. Will we let them get away with it again this time?

Note

1. For further reading on this issue, see: *Reason in the balance.* Phillip Johnson, InterVarsity Press, Illinois, 1995.

Reviews

Reading the Mind of God : Interpretation in Science and Theology, by Philip Duce. Apollos, Leicester. 1998. 159 pp. ISBN 0–85111–462–8. £14·99.

Reviewed by J. H. John Peet

Many books have been published on the supposed conflict between science and Scripture. At one extreme is the view that they must conflict because science is agnostic (if not atheistic!). For evangelicals though, the belief is that both, correctly understood, are true and ultimately must agree. Unfortunately, few of those involved in the debate understand even one position properly. Sadly even science undergraduates generally are not instructed in the history or philosophy of science and so are not aware of its strengths and weaknesses. It is into this arena that another gladiator enters to fight with the two lions. Philip Duce has researched in both fields and so is well-qualified to tackle the subject.

This book is not a trivial contribution to the debate and should be read by all seriously involved in the issue. It is a challenge to all combatants and should form a good platform for them to seek a peace accord. The author does not give a resolution to the conflict between, for example, creation and evolution, though he does highlight the philosophical issues. For those not used to philosophical jargon, some sections may be difficult to grapple with, but, in general, the arguments are clearly presented.

The book is in three parts. The first section surveys the philosophies of science and modern approaches to hermeneutics. In part two, the various approaches to the relationship between the two areas of knowledge are reviewed with a view to identifying an adequate model. Finally, the author looks at specific approaches to the application of scientific methodology to theology.

Scientists perhaps tend to over-value the methodology and infallibility of science; evangelical non-scientists perhaps tend to a naïve approach to biblical inerrancy. Phil Duce attempts to help each recognize the potential weakness of their position. The popular view by non-scientists is probably that there is a single scientific world-view and a single evangelical theological position. This book may be a rude awakening to such. No one position in scientific philosophy or hermeneutics can be said to be right. I was particularly pleased to see Dr. Duce mention (p. 133) that the mind and its processes are affected by our sinfulness. So, it is possible to end up with a naïve view of the ability of these searchers for the truth to find it.

Chapter two contains a review of some of the key philosophical positions in science, outlining their postulates and weaknesses. Many christian non-scientists quote Popper as if his is the true philosophy of science, even a christian one! As Duce says, such an idea, that there is a preferred position for the christian, is misguided. It indicates that the person does not even understand the issues. An interesting quote from Bronowski closes the chapter: 'Science is a very human form of knowledge ... Science is a tribute to what we can know although we are fallible.'

In the next chapter, the same process is applied to hermeneutics. Perhaps the startling aspect to the uninitiated is to see how far secular thinking has influenced this subject. Packer's comments (p.38) bring something of a relief! Duce builds on Packer's work to develop the concept of a hermeneutic spiral—'questioning the text and allowing it progressively to reshape the questions put to it.' The nature of being and the theory of knowledge must be biblically based if they are to be an adequate foundation to science or any other area of knowledge.

The author moves on in chapter four to the main theme of his thesis: 'relating the readings' of the two books of God, science and Scripture. The views are examined under the heads of conflict, independence, dialogue and integration. A useful table (p.60) summarises the different approaches.

In chapter five, Dr. Duce moves to produce a suitable evangelical model which remains true to the two approaches to the world of knowledge. He draws substantially on the work of J. P. Moreland for this. Of particular value to evangelicals is the critical review of the complementarity model of the late Prof. D. M. Mackay (p.63–69). Van Till has shown that the danger with complementarity is that it leads to compartmentalism (p.65). Perhaps the best summary of this approach is that it is useful (indeed, helpful) but inadequate. The author also deals with various other issues arising from this such as the 'language of appearance', accommodation and methodological naturalism.

Chapter six deals with the areas of conflict. The issue of the miraculous is touched on (p.80). Inevitably miracles are not subject to scientific investigation, but they leave a physical or historical signature which can be investigated. The on-going debate on infallibility and inerrancy is also tackled in some depth. Obviously this is essential to the discussion in order to delineate the problem. As Duce emphasises, the inerrancy of Scripture must not be confused with an inerrancy of interpretation.

So, it becomes possible to postulate an approach to dealing with the conflict (p.85f) adapted from the work of Paul Helm. Duce then seeks to apply the principles to two specimen areas of conflict: Jericho (p.89) and origins (p.90–99).

The reader may well feel that the book has reached its climax at this point. That is indeed the case, but the author adds another two chapters to amplify some of the issues raised in chapter four before he summarises the work in chapter nine.

This is an invaluable work and deserves a high profile in the science and Scripture debate.

[This review was originally published in *Evangelicals Now*.]

In Six Days : Why 50 scientists choose to believe in creation! edited by John F. Ashton. New Holland Publishers. 1999. 360 pp. ISBN 1 86436 443 2.

Reviewed by Steve Layfield

Success breeds success and a crowd seems to attract a crowd. This simple socio-psychological observation explains in part why biblical creationism continues to be marginalised and ignored by so many today. This is true in spite of the overwhelming body of factual data which it can marshal for support. For those of us who are *au fait* with the battle lines, as they have been drawn, and who have actively engaged the opposition, it is staggering and bewildering that the dogma of evolution which is so popular and so far-reaching in its influence today is so bereft of empirical scientific evidence. This book, *In Six Days*, provides us with a ready-made counter attack. The whole project comprises contributions from fifty PhD (or better!) scientists who explain from evidence, generally close to their field of specialism, why they prefer to believe that special (supernatural) creation provides a better rationale for origins than mere mechanistic naturalism. Each in turn is introduced and a brief summary is provided of their academic background. Many of the contributors are house-hold names to those who have followed the creation/evolution debate for years. Others are relative newcomers or else just less well known. Whatever their past affiliation and present qualification, each in turn shows, at times emphatically, why the straightforward biblical account of origins and speciation is consonant with the facts.

Particularly noteworthy and helpful to this reader were those contributions in which the author leaned on his/her own specialist knowledge: thus for example, John R. Rankin's excellent article indicating that many of the contemporary models of cosmic evolution are mathematically absurd; Ker C. Thompson's treatment of the second law of thermodynamics and the common 'wriggles' adopted by those who wish to avoid its hammer-blow; Edward Boudreaux's delightful account of chemical anomalies and surprises which turn out to be essential for life and Andy McIntosh's discussion of engineering excellence evident in various flying creatures.

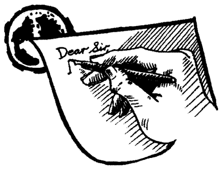
This 360 page mini-tome provides excellent bed-time reading. The chapters may be read in any order, though each one stands highly satisfactorily alone. As a scientist with very limited specialist knowledge however, I found the contents pages especially helpful. Here articles by physicists and cosmologists, most pertinent to me, were easily discovered. Notwithstanding, the contributions collectively provide an excellent introduction to the contemporary creationism scene.

Most appealing to me were those articles in which the authors clearly gave thoughtful consideration to how the biblical model of recent creation and world-wide catastrophe fits 'nicely' with the essential features of their own specific areas of expertise. Henry Zuill's article in which he shows how properly functioning ecosystems depend on organised division of labour provided by biodiversity is an especially good example. While showing that the emerging scientific understanding of biodiversity does not specify six-day creation he clearly demonstrates that present-day ecosystems function less than optimally—retaining something of their original pre-fallen perfection. This and other material of a similar ilk constitute a powerful apologetic to anyone who is aware of the specific technical matters dealt with.

A slight criticism, which is almost inevitable with an offering such as this, is the repetitive nature of some of the lines of thought and exposition. We are, for example all grateful to Michael Behe for his devastating demolition of gradualism and evolution *via* a consideration of the concept of 'irreducible complexity'. His work is referred to a great deal by several of the contributors. Critics of scientific creationism might suppose that we have a limited arsenal of empirical data! What actually emerges however, perhaps unwittingly by the various authors, is a plain and instructive demonstration of how this principle (irreducible complexity) finds application and ever-fresh examples in a whole plethora of scientific fields. In any case, that so many well qualified referees are prepared to stand by well-rehearsed lines of reasoning by more studied 'creationists' demonstrates the validity and trustworthiness of the standard arguments.

Not all the contributors are good writers. Doubtless they are all knowledgeable and competent. Few write with such sharp and incisive turn of phrase as Phillip Johnson for example. Nevertheless, this volume, if placed strategically in schools, universities, shop floors and local libraries (for example) should provide real cause for doubt among those whose hearts and minds are genuinely open to the wedge of truth. May God bless its use and enlarge its circulation. I shall most certainly purchase a few copies for loan/donation. Perhaps you should consider doing so too. For unless this message is widely circulated and loudly aired, we shall continue to be perceived as irrelevant and misguided.

Correspondence



W. D. Burrowes (Victoria, Canada).

Being nearly 80, I have been reducing the number of periodicals received but I am not yet ready to say goodbye to CSM or BCS.
[*Editorial comment:* Mr. Burrowes was a leading creationist in Canada for many years and did a good work over there. We appreciate his continuing support.]

F. H. Pullan (North Yorkshire)

I express gratitude for all the years of pleasure *Origins* has given myself. The format has improved radically and become very professional. I take this opportunity to thank you all and express my continued allegiance to your Aims.

J. Howard Spencer (Cromer)

I ... express my thanks for the work you do and for the very informative magazine. As a layman in scientific matters, some of your contributors go way beyond my own limited scientific understanding but I am nevertheless wholeheartedly and prayerfully supportive of the work you do.

A. W. Fowler (Mid Glamorgan)

Review of *A Drama of Creation*

An author must welcome any review because a hostile one is better than being ignored. He must also accept criticism however severe but misrepresentation is another matter. I therefore seek correction of a number of mistakes.

1. The reviewer wonders if at times I am favouring evolution rather than creation. The book is a vigorous defence of old earth creationism but concedes some minor evolution within major categories (page 56). This was the position adopted by the pioneers of the antievolution movement, such as the geologist, Douglas Dewar.
2. I do *not* suggest that Genesis 1–11 are non-literal. My comments were confined to Genesis 1 because of its unique dramatic structure. I list four key features of dramatic writing, which are found in Genesis 1, namely, structure (prologue, dialogue and epilogue); direct speech, selection of key events and time compression.
3. Chapter 17 makes it clear that man was a special creation. I did *not* suggest that God transformed a pre-Adamic being into man or that the Neolithic revolution

was the source of man. On the contrary, I maintain that the so-called cavemen (Palæolithic and Mesolithic) were unrelated to Adam. I pointed out that the Neolithic revolution began in the Euphrates valley in 4–5000 BC and that this corresponded to chapters 2–4 of Genesis where we find that Adamic man manifests all three of the features of the Neolithic culture, namely, agriculture, animal husbandry and metal working.

4. The reviewer completely misconstrues my statement that the fossil record must provide the best scientific evidence for evolution. This surely is a self-evident truth which is denied by evolutionists because the fossil record does not provide the evidence for evolution which they believe in. In chapter 11, I give a detailed refutation of the evolutionist's argument that the fossil record is not representative.
5. My statement that the fossil record reveals successive creations is dismissed by the assertion that the fossil record reveals successive destructions. I do not deny the latter and point out that the fossil record reveals sudden and dramatic bursts of life and equally remarkable disappearances of life (p.42).
6. On the question of the extent of the Flood, the reviewer asks a number of questions to which I give biblical answers which he ignores. I suggested that the extent of the Flood would have been the extent of wicked humanity and I asked how geologists explained the fact that the sedimentary rocks contain vast numbers of fossilized animals but practically no humans, and why most fossilized animals were so different from today's animals.
7. I am accused of an inadequate understanding of geology. However, I only deal with the vital evidence of *palæontogy* and, in this respect, the reviewer provides no evidence for inaccuracies in my description of the fossil record.

Finally, I do not say that young earth creationism is the barrier for evolutionists to believe in biblical creation. In chapter 1, I made it clear that it is young earth creationists' *insistence* that theirs is the *only* valid interpretation of the Genesis record that creates a barrier to evolutionists accepting the reliability of the Bible.

Lt. Col. J. C. Allen (Leicester)

Paul Garner raises the possibility that there might be a more extended discussion in *Origins* of the terminology that we use. Although this letter is scarcely extended, the issue of terminology is one that I think is important enough to warrant joining in. In doing so I have in mind a sermon I heard more than 20 years ago when a preacher from Stornaway baffled the English by using a Gaelic expression as there was no word in English he could use with exactly the same meaning and connotation. The words we use often control what we think, and sometimes it is not the dictionary definitions that influences us but the connotations and values that all words carry. The word 'evolution' carries with it the implication and connotation of 'chance and time' as the governing factors of origins—this is despite the attempt to join it with theism as in 'theistic evolution'. It also carries with it the implication of inevitable progress and development outside or within human control. This is amply demonstrated by the indiscriminate use of the word 'evolution' to describe any sort of change or development. In my own field of surgery, it is impressive how ideas and diseases and treatment regimes and operations no longer develop or are developed but they always and in every case 'evolve'. In fact, the only thing that continues to develop nowadays is property and I suspect it is only a matter of time before some enterprising property developer describes himself as a 'Property Evolver'. Further, using the term 'micro-evolution' to describe phenomena such as speciation also carries with it the connotation and implication of 'time and chance', as if these processes were blind and purposeless and therefore beyond or outwith God's control. As this is not the case, to use words which are so closely associated with the concept of random chance operating over long periods of time can be confusing.

Another point is whether the terminology of mega-, macro- and micro-evolution is restricted to creationists or whether 'true-blue' evolutionists also recognise the distinctions. Clearly, if evolutionists do use these distinctions, then they will do so in the conviction that all distinctions are for convenience and do not imply any difference in validity. It may be convenient to split the process of evolution into distinct phases, but this only makes sense if all phases are considered to be equally true. It is also confusing to argue that one part of a theory (micro-evolution) is true but the rest isn't when all parts are thought to operate the same way. If we are going to argue for a radically different approach to origins then we are better off using our own terminology where we can to some extent control what the words mean and the connotations they carry. It isn't really necessary to use the evolutionists terminology. An alternative scheme might be:

Creationist		**Non-creationist**
	Breeds/races	
Produced by the intrinsic *variability* created within each 'kind'	Species	
	Genera	
———	Family	**Evolved** possibly by mega-, macro- or micro-processes.
	Order	
Created	Phylum	
	Kingdom	

This differentiates those directly created from those produced by an intrinsic created variability which is itself created, and clearly differentiates that theory of origins from the theory that all evolved.

AUTHORS' RESPONSES

Paul Garner—*Response to Michael Oard*

We recently published a letter from Michael Oard (1999) in which he offered some thoughts on my fossil horse article (Garner, 1998). When Michael's letter was received, I was in the midst of marrying and moving house and was unable to reply! However, since then others have asked for my response to Michael's comments, so here it is.

Michael and I clearly agree on several points, and he mentions these in his letter. What we disagree about is the geological context of the horse fossils. Michael rejects the idea that the horse series is a palæontological record of speciation in real time. He says that the North American horse fossils are found in geographically separated basins characterized by rapid lateral facies change. He then questions whether it is possible to correlate strata between these basins. I am convinced by the evidence that correlations over wide areas, even between continents, are indeed possible. The conventional framework for Cenozoic biostratigraphy in the USA is a succession of 'life zones' or 'faunal zones' which were recognized in the early twentieth century based on relative dating methods. These 'faunal zones' were formalized by Wood *et al.* (1941) into 18 'provincial ages' which subsequently became known as North American Land Mammal Ages (NALMAs). Michael would no doubt object that the acceptance of such biostratigraphic correlations is an unacceptable concession to Darwinism. However, as MacFadden (1994, p.123) points out in his book on fossil horses, 'the principles of relative dating do not require evolutionary theory as part of the framework'. The historical reality behind the method, from a creationist point of view, is the radiation of populations after the Flood. It can be envisaged that rapid post-Flood speciation might lead to the development of species that are short-lived, and hence characteristic of particular narrowly defined periods. These short-range taxa provide a basis for correlating fossil-bearing strata. Readers who wish to explore further the principles underlying biostratigraphy are referred to Robinson (1997).

Obviously this Cenozoic biostratigraphy, painstakingly developed by geologists and palæontologists over generations, is not infallible. As new data are accumulated and new techniques devised, it sometimes requires revision. Recent developments include the use of remote sensing and satellite imagery to map early Tertiary fossil-bearing units in Wyoming, for example (Stuckey *et al.*, 1987; Krishtalka *et al.*, 1988). However, there is no reason why the relative dating methods that led to recognition of these faunal successions should not be acceptable to creationists. Even the results of radio-isotopic and palæomagnetic studies may be tentatively used by creationists in establishing relative dates. Creationist models incorporating increased radioactive decay and rapid geomagnetic reversals in the earth's past would allow these techniques at least to be used in a relative sense.

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In support of his scepticism about Cenozoic biostratigraphy, Michael refers to the re-dating of the Cypress Hills Formation. In this instance, the original early Oligocene date seems to have been based on the misidentification of *Miohippus* as *Archæohippus*, a superficially similar genus. This certainly serves as a cautionary example, but is insufficient justification for rejecting the whole framework of mammal (and horse) successions. The lesson to be drawn is that it is unwise to be dogmatic about a biostratigraphic date on the basis of a single fossil taxon. Storer and Bryant, in the quotation cited by Michael, suggest that the misidentification went unchallenged because there were 'no additional clues in the form of associated fauna'. A much sounder basis for biostratigraphy is to look at whole faunas, a point acknowledged by MacFadden (1994, p.138).

Michael's antipathy to conventional Cenozoic biostratigraphy is driven by the Flood model that he has adopted. Michael believes that virtually all of the Cenozoic was Flood-deposited. However, this position is geologically and scripturally untenable. Consider a few of the consequences of placing almost all of the Cenozoic within the Flood year:

- There should be an unmistakeable hiatus in the terrestrial fossil record beginning with the end of the Flood and gradually ending with the recolonisation of the Earth by animals from the Ark. No such hiatus of this kind can be identified in the Cenozoic.
- The animals fossilised in the Palæozoic, Mesozoic and Cenozoic should be very similar to those in the modern world (*i.e.*, Quaternary and Recent), since the latter descended from animals taken on the Ark and Michael believes that the animals in the Ark included representatives of all the animals fossilised in the Phanerozoic. This is not the case, however. Palæozoic and Mesozoic animals are radically different, and as the horse record exemplifies, the animals of the Cenozoic become like those of the modern world progressively.
- There are huge differences between the terrestrial fauna of the Mesozoic and that of the Cenozoic. Why are dinosaurs, for instance, never found in the same deposits as horses?
- There is an association between horses adapted to grazing and the rise of the grasses in the fossil record.

It is difficult to see how this can be explained in terms of a late Cenozoic Flood/post-Flood boundary.

- We would be faced with the problem of explaining why a huge variety of animals were still alive right at the end of the Flood, even during its 'recessional stage', contrary to the biblical record. There are abundant animal burrows and tracks in the Cenozoic, providing clear evidence of living animals. Furthermore, this evidence of normal life cannot be reconciled with the massive catastrophism which Michael believes was going on at the time.

Michael cites Cenozoic sediment volumes in support of his model. He refers to the Cenozoic in terms of 'its huge volume of strata', 'massive coal seams', 'massive worldwide uplift', 'huge volcanism', 'huge erosion', and 'massive deposition'. Michael gives the impression that volume equates with catastrophism, but this does not follow at all. It equates with catastrophism only if one presupposes an extremely brief time scale for these successions, and that is of course to beg the question. The horse series indicates that a substantial period must be allocated to the Cenozoic, in which case maximum average sedimentation rates are greatly reduced from those presupposed by Michael.

Michael's late placement of the Flood/post-Flood boundary leads him to conclude that the Cenozoic horses were co-existing pre-Flood animals that were deposited and fossilised at about the same time during the late Flood. Michael's position is logical. We may agree that if the horse series is real, then it is very difficult to imagine how it might have formed during the Flood. However, Michael has failed to demonstrate that the horse series is an illusion; I maintain that it is real, and that post-Flood speciation and dispersal events provide a cogent framework for understanding it.

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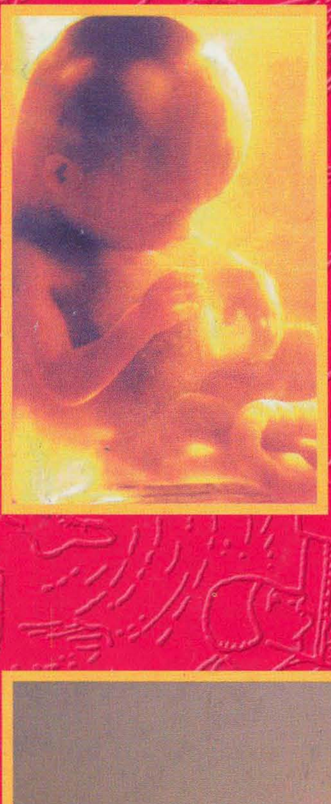

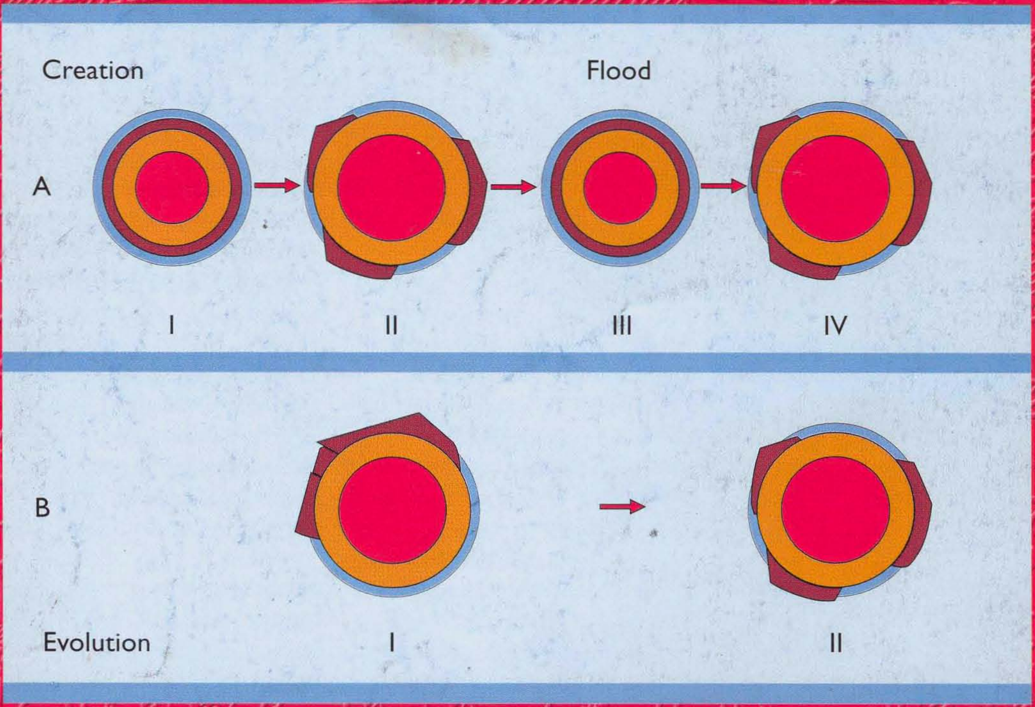

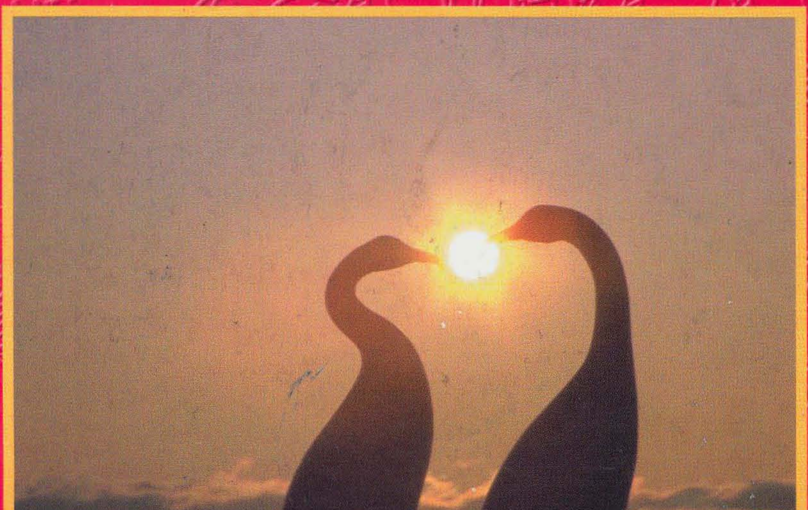

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